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LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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Editorial Notes.

Greetings!

THIS issue of the "JOURNAL" finds the members of the Institution of Gas Engineers assembled in London for the annual meeting; and to one and all we extend hearty greetings. In more than one respect they are, so far as the Institution is concerned, "making history;" and we are satisfied that they are doing it well. As the years go by, there is naturally a tendency for the technical programmes to become longer. This is not the case on the present occasion in the matter of papers, properly so-called, for there are fewer of these than usual; but the investigation and research side of the Institution's activities—a branch of work which must prove of inestimable value to the industry—is being continually extended, and this week, to the reports of the other Committees, there has been added the first report of the Ammonia Sub-Committee. The Charter and the Education Scheme are also under consideration.

With so much of importance to be chronicled, we find ourselves faced with insuperable obstacles to including it all in one number of the "JOURNAL." Already we have been forced to resort to the inclusion of abstracts only of the reports of the Joint Research Committee of the Institution and the University of Leeds; and this year we are extending that method of treatment to the Gas Fellowship Report. This, however, does not seem to be sufficient; and in other directions also we have considered it desirable to take steps with a view to confining within reasonable bounds next week's number of the "JOURNAL," which will contain the papers and reports of the various discussions. To-day we publish the address of the President (Mr. John Terrace, M.Inst.C.E.), the Annual Report of the Council of the Institution, and the report of the Committee of Management of the Benevolent Fund. We are, too, giving some particulars, with illustrations, of the works of the South Suburban Gas Company, of which the President is Chief Engineer, and which are to be visited to-morrow (Thursday) afternoon. Another feature which will prove of value is a translated description of what will be seen by the party who are leaving London for Berlin on Friday evening, when the time arrives for them to inspect the German Gas and Water Exhibition there.

With next week's issue subscribers will have, besides the reports of the discussions, &c., our customary review of the whole of the proceedings, so that it will, as before, constitute a self-contained record of the meeting. We feel that the course now being adopted will make things easier for our readers, as well as for ourselves, and that it will therefore commend itself to them as it does to us. The Institution meeting is a "cherry" which may well stand "two bites."

Mention has been made of the visits to the Sydenham Works of the South Suburban Gas Company and to Berlin; but there is also another one by river to historic Hampton Court on Friday, which, given fine weather, should prove delightful. The river scenery is at its best, while the Palace gardens and Bushey Park are sights to be long remembered. The journey, too, will afford opportunities for discussing the performance of this week and the promise which the future holds out.

An Inspiring Presidential Address.

SELDOM has the Institution of Gas Engineers listened to such an inspiring Presidential Address as that delivered yesterday by Mr. John Terrace, whose year of office has been one of singular interest and accelerated development in every phase of the gas industry's work. First and foremost there has been the granting of the Royal Charter, which will, in all directions, strengthen the industry by enabling the many technical problems which confront it to be discussed on a broader and more co-operative basis than ever before. The portals of the Institution have been opened to those who are demonstrably best fitted to guide the administrative policy of our great and growing industry, and they have been closed to those who can show no reason why they should be admitted to membership.

The granting of the Royal Charter formed a fitting occasion for a review of the industry's past history and achievements. It is not our purpose here to review a review, for we fully realize that everything which Mr. Terrace said will not only be read with the liveliest appreciation, but will act as a firm basis for future endeavour. Attention may well be called, however, to the comparatively recent liaison with the University of Leeds, and how the fruits of this first co-operative effort in research and fundamental training have been reaped in a more accurate knowledge of the technique of gas-making and in an infusion of disciplined and active mentality into the ranks of the industry. Mr. Terrace announced that this year another scholarship, to be known as the William Cartwright Holmes Scholarship, has been accepted. This is to commemorate the work done by one of the most creative pioneers in the gas industry; and no more useful memorial could have been instituted. Concerning the research work accomplished jointly by the Institution and the University, there will be whole-hearted agreement with the claim of Mr. Terrace that the past record is no mean achievement, and that the activity during the last few years gives promise of greater results in the future. This co-operative endeavour led to wider alliances, too well known to reiterate here, but which each year become stronger and more pregnant of progress. The latest development is, of course, the association of the industry with technical bodies other than those directly connected with gas supply. An example of this is the Joint Fuel Committee of the Society of Chemical Industry, the Coke Oven Managers' Association, the Institute of Fuel, and the Institution of Gas Engineers.

Speaking of the Royal Charter, Mr. Terrace observed

that "no claim for originality for the endeavour to widen our doors is thought of by those who have worked successfully towards its attainment... it was ever so; some sow, and others reap." In the question of education, however, which is so closely allied to the matter, Mr. Terrace can justifiably claim to have sown; and the industry will reap the benefits of the strength and clarity of his decisions. He has marked out and paved the pathway of those who aim at membership of the Institution; and a revised Handbook of Education has been prepared which will offer an excellent workable solution to many of the problems which have retarded the progress of the Education Scheme. It is in this direction, perhaps more than any other, that Mr. Terrace's beneficent year's work will be remembered. The President referred to the resignation of Mr. Walter Hole from the office of Organizing Secretary of the Education Scheme. "The strenuous work which he did in the early days," remarked Mr. Terrace, "in advocating and explaining the Scheme, and the services which he has since rendered, will long be remembered with gratitude by those who worked along with him; and he takes with him their sincere thanks and best wishes." We are glad to record this expression of appreciation.

Turning now for a moment to the President's observations on the current developments and future possibilities of gas-making plant, we would refer to his suggestion that there appears to be a considerable field for the use of complete gasification units for dealing with coals yielding coke of too high an ash content to be suitable for sale. Such plants, he remarked, should be able to supply gas of "reasonably high calorific value capable of being changed at will." He had in mind plant such as at Mill Hill, which was described in the "JOURNAL" for March 13, p. 727. Then he refutes the purely prejudiced idea that gas undertakings are antagonistic to low-temperature carbonization—a prejudice which in public utterance is thought to provide a little wind for the sails of those who are navigating the low-temperature craft. To add point to his reputation, he mentions the low-temperature carbonization plants installed by the Gas Light and Coke Company and the South Metropolitan Gas Company—to whom, he observed, the thanks of the gas industry are due. The aim of "cheaper gas" is being attained by the use of silica and siliceous materials in retort settings, by improved carburetted water gas operation, and so on; but there are external means by which fulfilment of the aim will be quickened—amalgamation without interference with the rights and privileges of the smaller companies, and without removing the advantage of local interest and control; and greater attention to coke sales (in which regard, attention may be called to the President's remark that there is plenty of scope for those of inventive capacity to devise an improved type of breaker, and that the time seems ripe for encouraging the fixing of suitable grates for burning coke).

We will refer briefly to three further important points dealt with by Mr. Terrace—distribution and storage; the laying of mains and services; and the lighting load. Regarding the first-named topic, the President mentioned the advance which has been made during the past year in the erection of waterless holders of the "M.A.N." type, and in the building of the first "Klönne" holder in this country. Reliable information of the comparative costs of these Continental designs and holders of British design would be a valuable contribution to the knowledge of those contemplating extension of their storage. Mr. Terrace also spoke of another departure from the beaten track—the storage of gas under pressure, which, in many cases, might avoid the dissatisfaction caused by variation in pressure at consumers' premises. In regard to the laying of mains and services, the President called attention to the articles which Mr. R. W. Edwards, of the Aldershot Gas, Water, and District Lighting Company, contributed to the "JOURNAL" last year (see Vol. 184, pp. 183, 250, 320). Some simple allocation of position in the footway to those public bodies providing the services demanded by the householders is needed; and in this connection we agree with the President's assertion that the expense of double mains and short services is little more than a single main and long services. Moreover, short services make it easier to give that very desirable regular pressure. Then there is the lighting load, which is still the mainstay of most gas undertakings. Greater efforts, said Mr. Terrace, are needed to maintain and extend the use of gas in the field of illumination; and he urged that the properly qualified younger members of our profession should associate themselves with the work of such bodies as the illuminating Engineering Society and the Association of Public Lighting Engineers. We have often bewailed the apathy shown in maintaining the status of the industry in this respect.

As a final note to his address, Mr. Terrace placed on record the Institution's appreciation of the long and faithful services of the late Secretary, Mr. Walter T. Dunn.

Where Are We?

THE General Election is over; and the net result, at the moment, is that matters have been left in a far greater state of uncertainty than was the case before. This is the outcome of the expenditure of a vast amount of money, and of much disturbance to business as a whole. Those who did their duty at the polls last Thursday may well feel disappointed; those who did not take the trouble to vote, have, of course, no right to complain.

Ever since the broad results of the voting became known, speculation as to what will happen has been rife; but there is one outstanding fact which no amount of assertion or argument can alter. We are faced with the absurd position that our electoral system—our plan for "popular representation"—has operated in such a way as to place the greatest power in the hands of the weakest of the three principal Parties. This is a state of affairs which cannot by any stretch of the imagination be regarded as other than unfortunate—except, perhaps, to the "weakest Party," and even they are unlikely to derive a great amount of solid satisfaction from it. Mr. Baldwin's Party will return to the House of Commons about 140 smaller in number than before the election; and Mr. MacDonald's followers will be almost proportionately enlarged. Mr. Lloyd George's Party has grown a little; but, as has already been remarked, the relative figures will be such as to place with it the power to "turn the scale." In these circumstances, the government of the country will continue until another General Election becomes necessary—which will in all probability be sooner, rather than later. Meanwhile, any legislation of a startling character is hardly to be looked for; and if things are not so promising for the business community as they might have been, neither are they so bad as could have been the case. This guarantee against extremist legislation is, without doubt, the most welcome aspect of the election.

Glancing down the results of the polling, we find that, with a split vote, in many constituencies the Conservative Party have lost the seat; and in this way we have to regret the defeat of Mr. Reginald G. Clarry, who, while representing Newport (Mon.), has done excellent work in guarding in the House of Commons the interests of the gas industry. We are also sorry to note the non-success, at Reading, of Mr. H. G. Williams, who, as Parliamentary Secretary to the Board of Trade, had much to do with piloting the Gas Undertakings Bill through the shoals and quicksands of the House. Many other well-known names have disappeared—temporarily, it will be hoped—from the list of Members.

In different newspapers one sees the political creeds of the same candidates differently described; and this would appear to be a matter which requires looking into. For example, in one, the designations appear as Labour, Unionist, Liberal, and Others; in another, as Conservatives, Liberals, Socialists, and Independents. The term "Unionist" may be thought to have long since lost its application; while the title of "Labour" may well secure far more votes than would be cast for candidates who openly dubbed themselves "Socialists." The interests of Labour are not the monopoly of any one Party; and bestowing upon certain persons the title of Labour candidates introduces the "class" feeling into the very beginning of things. Also, it must tend to confuse the electors. While the vast majority of voters labour, in one way or another, many of them who have at heart the interests of Labour are not Socialists. If the Labour Party is in reality the Socialist Party, let it sail under its true colours. The electors will then know exactly for what (as well as for whom) they are casting their votes.

Corrosion of Cast-Iron Mains.

SELDOM is the question of corrosion discussed at meetings of gas engineers, and yet it is a subject of very great importance. The capital of the gas industry which is sunk underground, where decay goes on unseen, is enormous; and anything which can bring to light methods of minimizing this decay should be encouraged. Perhaps it is the abstruse nature of the subject which retards ready discussion. Whatever the cause, however, there is full justification for Mr. J. R. Bradshaw's assertion that something ought to be done to give more adequate information on the behaviour of the industry's unseen underground works; and the paper which he contributed to last Friday's meeting of the North of England Gas Managers' Association is much to the point.

Part of the paper is devoted to a description of an investigation of eight pipes of varying sizes, ages, and conditions of burial. The investigation, states Mr. Bradshaw, makes it clear that a comprehensive inquiry would be most helpful. We suggest that the first stage of any such inquiry should be to collate existing information, of which there is a great deal. For example, there is the recent work of McAdam and Moore on corrosion fatigue produced by exposure to corrosion and stress, which has opened up a new and very important phase of corrosion study. Then there is the research of Mr. Hikozô Endo, to which brief reference was made in last week's "JOURNAL." Mr. Endo has made an attempt to find out the effect of strains different in amount and kind (tension, torsion, compression, and impact) on the liability of iron and steel to corrosion; and from the results obtained he concludes that, if the stress is so large as to give rise to a permanent deformation, its effect, consisting in the promotion of corrosion, begins to appear. The degree of corrosion varies with the amount of deformation. In this connection, Mr. Bradshaw puts in a plea for further test data on the capacity of cast iron to resist repeated or alternating stresses, and suggests that gas engineers would be well advised to become acquainted with tests of Moore, Lyon, and Inglis, which show that, while brittleness is regarded as an inherent property of cast iron, yet it can suffer permanent deformation by some intra-crystalline slip, with consequent favourable readjustment of stress-distribution without starting a fatigue crack. The author's description of experiments illustrating the astonishing flexibility of cast-iron mains is extremely interesting, particularly in view of the ever-increasing stress and strain to which pipes are subjected by modern traffic.

We might call attention to the recent treatment of galvanic corrosion by Evans, Kohman and Sanborn, Lueck and Blair, and Manton and Lincoln. Whereas in the past the progress of galvanic corrosion has been conceived to depend largely on some inherent property in the metals involved, the newer view appreciates the importance of the corroding medium and the products of corrosion as modifiers. Then there is the subject of electrolytic corrosion by stray earth currents, which was so ably investigated by Antoine Bolzinger (see "JOURNAL," Vol. 179, p. 499); and the work of J. G. Taplay on the effect of acid and alkaline earths upon wrought-iron and steel pipe is not forgotten.

Another point which emerges from the investigation is that, if a standard and unvarying quality of iron, of a known and high density, and of standard structure, could be relied upon, "we should"—to quote Mr. Bradshaw—"be a long way on the road to an almost indefinite life of our buried ironwork." And in this respect the author expresses his favourable opinion of the spun pipe from the points of view of both microstructure and practice in various earths. The perfect iron pipe, however, is not yet with us; and until it comes closer attention will have to be directed to protective coatings—not merely to the intrinsic value of these coatings, but also to correct and effective methods of application, which include the proper preparation of the pipe surface. In many cases the full value of protective materials has not been derived, due to faulty methods of use.

The King's Birthday Honours List.

Our readers will join with us in congratulating Sir Edward Allen Brotherton, Bart., who has been created a Peer, for political, public, and charitable services. Well known to members of the gas industry, he is Chairman of the British Aniline Company, of Messrs. Brotherton & Co., Ltd., and of the Shettlestone Oil and Chemical and Wear Fuel Works. He was a Member of Parliament for Wakefield in 1902-10 and 1918-22. For public and political services, Mr. J. P. Houfton, Chairman of the Bolsover Gas Light and Coke Company, of Commercial Constructions, Ltd., and of the Harpic Manufacturing Company, has been created a Knight; and Sir Arthur Duckham, K.C.B., who recently returned from Australia, which he visited as Leader of the British Government Economic Commission, has been made Knight Grand Cross of the British Empire (G.B.E.). Sir Arthur is, of course, Chairman of the Woodall-Duckham Companies.

British Industries Fair.

Arrangements for the forthcoming Heavy Section of the British Industries Fair in Birmingham are even more advanced than at the corresponding stage of organization for the last Fair, for which the whole of the stand accommodation was booked seven months before the opening. It was reported at a meeting of the Birmingham Fair Council quite recently that more than 60 p.ct. of the space has already been let. The chief explanation of this speeding-up is probably to be found in the fact that the period at which current exhibitors could exercise their option to retain the same sites was on this occasion limited to some ten weeks after the close of the last display. Approximately one-fifth of the firms have already taken advantage of the opportunities now offered to secure their stands for five consecutive years. This early reservation of the major portion of the space greatly facilitates the policy of grouping kindred interests which was put partly into operation last February, and is to be considerably extended in 1930.

"Field's Analysis."

In later columns will be found a review of the ever-popular "Field's Analysis." The figures for the year 1928 are now available, and should prove very welcome, coming as they do during the Institution Meeting. The compilation is again in the hands of Mr. H. E. Ibbs, Chief Accountant to the Gas Light and Coke Company; and the work will be found to be of the usual high order associated with this publication.

PERSONAL

Mr. W. I. HALLAM has been appointed Controller of the Fitting Department of the Bedford District Gas Company.

Mr. PETER LOW, Chief Draughtsman and Assistant Engineer of the Dundee Corporation Gas Department, has been appointed Gas Engineer to the Gas Department at Elgin.

OBITUARY.

We regret to have to record the death of Mr. HENRY W. FALKNER, who was Engineer and Manager of the Sandown Gas and Coke Company, Ltd., for over thirty-one years. He retired at the end of 1924, and went to reside in Southsea, where death occurred on May 27, after an illness lasting about ten weeks. His son, Mr. R. S. Falkner, is Engineer and Manager of the Company.

FORTHCOMING ENGAGEMENTS.

June 8.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to Worthing.

June 19.—ASSOCIATION OF STATUTORY INSPECTORS OF GAS METERS.—Annual General Meeting in the County Hall, Westminster: President, Mr. H. N. Barrow, J.P.

June 27.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council Meeting in the afternoon.

July 5.—MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.—Visit to the Halifax Gas-Works and to the Works of Messrs. Drakes, Ltd.

July 9.—NATIONAL GAS COUNCIL.—Meeting of Central Executive Board.

Sept. 12.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting at St. Andrews.

BRITISH INDUSTRIES FAIR, BIRMINGHAM.

New General Manager.

As announced in our columns last week, Mr. C. Elliott, B.Sc., A.M.Inst.C.E., A.M.I.Mech.E., has been appointed to the position of General Manager of the Birmingham Section of the British Industries Fair, in succession to the late Mr. Charles Stanley. Mr. Elliott has taken a prominent part in the organization of the Heavy Industries display for three years.

He was the Hon. Organizing Secretary of the National Smoke Abatement Exhibition held in Birmingham in September, 1926, during which an important series of conferences on every phase of the subject was conducted by the leading scientific and other authorities. Immediately afterwards he was placed in charge of the great Steam Power Section at the 1927 British Industries Fair—the first occasion on which those participating combined in making a representative display.

It was at this period that Mr. Elliott began to act as Technical Assistant Manager to the Heavy Section of the Fair, under Mr. Stanley. Many of the changes and improvements which have given rise to such favourable comment on the part of exhibitors and buyers at recent Fairs were the result of practical suggestions in reports to his Chief. The enormous extensions to the Fair Building each year were carried out from his drawings, which, in addition to securing greater efficiency for the purpose than the scheme previously in contemplation, effected economies in erection costs often amounting to 50 p.ct.

Now only forty-one years of age, Mr. Elliott has had an active career since he left St. Andrew's College, Dublin, and took his engineering degree of Bachelor of Science at Victoria University, Manchester. From a pupil apprentice at works of the Great Central Railway, he became Assistant Locomotive Superintendent of the Sheffield district, and later Chief Engineer of large chemical works in North Wales, where, incidentally, new buildings occupying twelve acres were erected to his designs at a cost of over £500,000.

Seven years were devoted to private practice as a Consulting Engineer in Manchester. As Hon. Secretary of the Smoke Abatement League of Great Britain—when he came to it, a small local Society with an annual income of £18—he formed branches and associations all over the country, with affiliations by seventy municipal and other public bodies.

Mr. C. ELLIOTT, B.Sc., A.M.Inst.C.E., A.M.I.Mech.E.

GAS STOCK AND SHARE MARKET.

[For Stock and Share List, see later page.]

The uncertainty of the political position last week made market operations difficult and dangerous. Business in both the investment and speculative markets were at a low ebb, and though dealers, as a precautionary measure, lowered quotations, there were few buyers. On Friday, when some reliable estimate could be made of the final result of the election, there was a slight improvement, but the disquieting news regarding the King's health was an adverse factor. The lack of success attending the Australian Conversion Loan, of which 45 p.ct. was left with the Underwriters, was attributed to the Money Market conditions; but in the case of the Central Electricity Board's issue, of which no less than 76 p.ct. was left untouched, this was partly due to the high price. Both issues were dealt in at a discount.

The Gas Market was not materially affected. Transactions were fewer, and in some instances investors were able to secure parcels at low prices. The changes in quotations were not important. Continental Union dropped 2 points, and Newcastle was marked down 3d. at the local exchange. Imperial Continental is now quoted *ex* dividend at 420-440—a drop of 30 points—but the price still includes allotment rights which have been valued at about 70.

The accounts of the Malta and Mediterranean Gas Company received during the week show an improved balance of profit, and the Directors are recommending a final dividend of 5 p.ct., making 9 p.ct. (f.o.t.) for the year as compared with 8 p.ct.

The South African Lighting Association are recommending the same dividend as before—viz., 4 p.ct., less 2s. 6d. tax, for the year, but the carry forward is about £1200 less.

The following transactions were recorded during the week:

Monday.—Brighton and Hove 6 p.ct. 114½, 115½, British Gas Light 118, Commercial 98, 98½, Continental Union 124½, 127½, European 16¾, 17, Gas Light and Coke 19s. 3d., 19s. 4½d., 19s. 6d., 19s. 7½d., 4 p.ct. pref. 77⅛, 5 p.ct. deb. 100¾, Imperial Continental 456, 457, 458, 460, 461, 462, 463, 464, 465, 468, 469, 469½, 470, Primitiva 35s. 4½d., 35s. 6d., 35s. 10½d., 36s., 36s. 3d., San Paulo 6 p.ct. pref. 81½, South Metropolitan 105, 6½ p.ct. deb. 102. Supplementary prices, East Surrey 6 p.ct. pref. 100½, Folkestone 83, 83½, Yorktown and District New 5 p.ct. pref. 92½.

Tuesday.—Alliance and Dublin 98, British Gas Light 5 p.ct. deb. 96, Cape Town 4½ p.ct. pref. 67⅞, European 17 1/16, 17⅛, Gas Light and Coke 19s. 4½d., 19s. 6d., 19s. 7½d., 3½ p.ct. max. 63⅞, 3 p.ct. deb. 59½, Imperial Continental 445, 447, 448, 450, 452, 453, 455, 458, Primitiva 34s. 6d., 34s. 9d., 35s., 35s. 3d., 35s. 6d., South Metropolitan 104½, Wandsworth, Epsom Stock 5 p.ct. 130.

Wednesday.—Alliance and Dublin 97½, 98, Barnet Dist. 7 p.ct. max. 116½, Commercial 3 p.ct. deb. 56½, European 16½, Gas Light and Coke 19s. 4½d., 19s. 6d., 19s. 6¾d., 4 p.ct. pref. 77¼, 5 p.ct. deb. 101, Imperial Continental 437, 438, 439, 440, 442, 442½, 443, 445, 447, 448, Primitiva 34s. 3d., 34s. 4½d., 34s. 6d,. 34s. 9d., 34s. 10½d., 35s., South Metropolitan 104¾, 105, 105¼. Supplementary prices, Aldershot 7 p.ct. bds. (reg.) 102, East Surrey 5½ p.ct. pref. "A" 97, Hartlepool cons. (5 p.ct. max.) 82½, Liverpool 5 p.ct. std. 95¾.

Thursday.—Bournemouth 3 p.ct. deb. 56, 56½, British 5 p.ct. deb. 96½, Commercial 98, Gas Light and Coke 19s. 4½d., 19s. 5¾d., 19s. 7½d., 3½ p.ct. max. 63½, 64¼, 3 p.ct. deb. 61½, Imperial Continental 437, 438, 440, 442, 444, 445, 446, Primitiva 34s. 6d., 34s. 9d., 35s., 35s. 3d., Tottenham 3½ p.ct. std. 107, Wandsworth 4 p.ct. deb. 78. Supplementary prices, East Surrey 5½ p.ct. pref. "A" 95, 96, Grays and Tilbury "B" 7 p.ct. 11½, 11¾, Southend-on-Sea cons. 93, 94, Swindon United 5 p.ct. 70½, Tottenham 5 p.ct. pref. 89, Wrexham 5 p.ct. 61.

Friday.—Alliance and Dublin 98, British 5 p.ct. deb. 96½, Gas Light and Coke 19s. 4½d., 19s. 6d., 4 p.ct. pref. 76, 77⅛, 3 p.ct. deb. 62, Imperial Continental 420, 422, 425, 426, 427, 428, 430, 432, Primitiva 33s. 6d., 33s. 9d., 34s., 34s. 3d., 34s. 6d., Tottenham 3½ p.ct. 107, Uxbridge 5 p.ct. 94½. Supplementary prices, Montevideo new 9d. pm.

Monetary conditions were comfortable at the week-end, but the Discount Market was affected by the weakness of the American exchange and the rate at which Treasury Bills were allotted. The rate averaged £5 6s. 6·06d. p.ct., or exactly 1s. 8d. p.ct. below that of the previous week. As regards the short loan market, renewals were arranged at 4½ p.ct.

Silver was again lower at 24 5/16d. per oz., while Gold was unchanged at 84s. 11½d. per oz.

The Bank Rate is 5½ p.ct., to which it was raised from 4½ p.ct. on Feb. 7. The Banks' deposit rate is 3½ p.ct., and the deposit rates of the Discount Houses are 3½ p.ct. at call and 3¾ p.ct. at notice.

THE INSTITUTION OF GAS ENGINEERS.

ANNUAL MEETING IN LONDON, JUNE 4-7.

PRESIDENTIAL ADDRESS OF MR. JOHN TERRACE, M.Inst.C.E.

Your constitution ordains that each year some one shall be appointed to preside over the deliberations of the members during the year, and I am deeply conscious of the tribute you have paid me in placing me in that high and honourable position. I desire, therefore, to take this opportunity of expressing my thanks, and to assure you that during the year now fast drawing to a close I have done my best to carry out the onerous duties devolving on your President.

It was my good fortune to be associated in the Council with a number of members, who felt that the time had arrived when alterations should be made in its constitution and rules, if the Institution was to maintain its usefulness and dignity and take its rightful place among the technical and scientific institutions of the country. The application for a Royal Charter, and the variation of the rules to admit only those properly qualified by training and education, were the direct result; and opportunity was taken to make closer our association with those engaged in allied professions whose scientific attainments and practical experience made their presence in our midst desirable. The alteration in the qualification for membership appeared to us to be absolutely imperative, and no claim of originality for the endeavour to widen our doors is thought of by those who have worked successfully towards its attainment. They recognize and chronicle the fact that in the past others have advocated this step to broaden our sphere of usefulness; but it was ever so, some sow and others reap.

The granting of the Royal Charter is a fitting recognition of the position of our technical institution in the important gas industry, and I trust that we shall prove worthy of this high honour. It is an important milestone in our history, and forms a fitting occasion for a brief review of our past history and work.

Our origin was, as you are aware, the British Association of Gas Managers, the preliminary meeting of which was held at Manchester on Dec. 15, 1863. Commencing the following year with a membership of about 70, the number had increased to about 750 in 1882, when the name was changed to "The Gas Institute." In February, 1891, owing to internal dissension, "The Incorporated Institution of Gas Engineers" was formed, and during the next twelve years the gas industry had two technical institutions. Happily, in 1903, an amalgamation took place, and since then the present Institution of Gas Engineers has provided the platform for reading and discussing papers, and become the channel for developments which have been of inestimable value to our industry. In 1907 research of a more academic character was commenced, in 1911 the British Commercial Gas Association was formed, and in 1916 the National Gas Council came into being; and each of these is worthy of more than passing notice.

RESEARCH, WITH LEEDS UNIVERSITY ASSOCIATED.

Though a great part of the work of our Institution may be looked upon as research—the papers contributed being the result of research on that particular subject by the reader of the paper—our association with the academic side of research appears to have been the result of a suggestion made in 1904 by Dr. Carpenter, the Chief Engineer of the South Metropolitan Gas Company, that "the hygienic effect of gas lighting should be threshed out by a scientific and medical committee working in conjunction with the Council of the Institution." An appeal was made to gas undertakings for funds to carry out work of this nature, and by 1907 the co-operation of the University of Leeds was arranged, and this proved to be the beginning of a useful association between that body and the Institution for carrying out research. Gas heating was the first research undertaken, and three useful reports were contributed in 1909, 1910, and 1911.

In 1909 a Professorship of Coal Gas and Fuel Industries was instituted at Leeds University by funds contributed by the industry as a memorial to Sir George Livesey, making another and closer link with the University, and in 1913 Sir Corbet Woodall donated a sum of money to provide a scholarship bearing his name for students in the Gas Engineering course to commemorate the jubilee of the Institution. This year another scholarship, to be known as the William Cartwright Holmes Scholarship, has been accepted, and should prove helpful to students intending to enter the gas industry by taking the course in Gas Engineering at the Leeds University. It is to commemorate the work done by one of the pioneers in the gas industry, who in 1850 commenced to design and equip complete gas-works for provincial towns in Great Britain and abroad, and had completed upwards of 100 such works prior to his death in 1882. A Fellowship in Gaseous Fuel was also provided at Leeds University by the Institution in 1907, and the reports on work done form a valuable addition to the Transactions of the Institution. It is interesting to note that many of the Gas Research Fellows are now engaged in the Industry itself, while the others are very closely connected with it. Taking them in the order in which they held the Fellowship:

Arthur Forshaw, M.Sc., is with R. & A. Main, Ltd., and

Harold Hartley, D.Sc., with Radiation, Ltd.

Harold Hollings, M.Sc., after service with the South Metropolitan Gas Company, is now Chief Chemist to the Gas Light & Coke Company.

A. C. Monkhouse, Ph.D., is Research Chemist to the Effluents Sub-Committee of the Institution.

Stuart Pexton, Ph.D., is with the Gas Light and Coke Company.

C. B. Marson, B.Sc., is a Research Chemist of the Joint Research Committee of the Institution and the University.

J. A. Sutcliffe, B.A., is at the Fuel Research Station at East Greenwich.

F. J. Dent, B.Sc., is Research Chemist of the Joint Research Committee of the Institution and the University.

In 1913 the subject of ventilation research was proceeded with, and reports were presented in 1914, 1915, and 1916. The work on ventilation then came to an end for the time being, for, owing to the exigencies of the war, it was felt desirable to obtain reliable figures on the influence of chemical composition and calorific and lighting values of gas and efficiency in use. This took place before the Government had constituted the Fuel Research Board under Sir George Beilby, F.R.S.; and in October, 1918, there was presented a most valuable report on a subject on which there were many divergent opinions, and the information given prepared the representatives of the in-

dustry to discuss with the Fuel Research Board proposals for modifications in the system of charging for gas, and paved the way for the Gas Regulation Act of 1920.

The name of the Joint Committee carrying out research varied from time to time. In 1908 it was known as the Gas Heating Research Committee, in 1913 as the Ventilation Research Committee, and, in 1916, the Joint Committee on Gas Heating, Lighting and Ventilation Research of the Institution of Gas Engineers and the University of Leeds. It was then felt that the question of the type of gas which, in existing and impending circumstances, it would be best to aim at supplying, was a very complex one, involving more than had been referred by the Council to the Committee; and a larger Committee under the title of the Gas Components Committee was appointed. As this name gave rise to some misunderstanding, it was re-named the Gas Investigation Committee; and it incorporated with itself as a Sub-Committee the Committee which was already engaged in experimental work upon heating and lighting efficiency of different grades of gas. Prof. A. Smithells was appointed Chairman, and from 1919 valuable reports, some twenty in number, have been contributed. They cover a wide field, and form a welcome addition to the reference literature of the industry. A list of them is given in the Appendix. Particulars of publications of the Fuel Research Board have also been added for reference.

In 1928 it was found desirable to modify the arrangements for research work, and the General Research Committee replaced the Gas Investigation Committee, and is responsible for all research work. The Sub-Committee which carried out such useful work in the past will continue to do so under the title of the Joint Committee of the Institution and Leeds University, and other Sub-Committees will investigate other problems which their titles indicate. The General Research Committee will meet at regular and fairly frequent intervals, and form a liaison between the various Committees and the Council of the Institution. In this way it is hoped that an enlarged sphere of usefulness will be covered.

Other research work has been carried out from time to time by committees appointed for each special purpose, but these can only be touched upon very briefly. Each of them is of considerable importance; and full details are to be found in the published Transactions of the Institution.

Carbonization.

In the decade immediately preceding the outbreak of war in 1914, there were great activity and development in carbonization; and it is not surprising that a subject so important as methods of carbonization should be delegated to a special Committee for investigation. The reports of this Committee between 1908 and 1911 form very interesting study. In them will be found early tests on Dessau vertical retorts, and a review of carbonizing processes in this and other countries; and the Committee's concluding remarks that "it is probable that no particular design of plant, nor system of working, will give the best results from all classes of coal, and that local conditions must govern the determination as to the best course to adopt in each instance" are worthy of careful consideration to-day.

Refractory Materials.

About the same time as the carbonization investigation, the other users of refractory materials besides ourselves appear to have turned their thoughts to that subject, for in January, 1908, the Ceramic Society started a movement having for its object the grading and standardizing as far as possible of the refractory materials such as fireclay, magnesite, &c. Their interest received an impetus from the discussion which followed a paper read by F. J. Bywater before the Institution in the following June; and shortly afterwards our Council were invited to appoint representatives to attend a conference on the matter with representatives of the Society and other interested associations. A small Committee, with F. J. Bywater as Secretary, was formed; and after general inquiry it co-operated with the Society of British Gas Industries, and in December, 1910, issued the first section of a specification dealing with retorts. In June, 1911, the second section for firebricks generally was approved; and these specifications did much to remove from the manufacturers of firebrick materials the reproach that they could not make an article which was capable of giving such satisfaction as that made abroad. The third section, relating to silica bricks, blocks, tiles, &c., along with a revision of sections 1 and 2, was available by June, 1912. The use of these specifications effected a considerable improvement in the quality and uniformity of refractory materials used in gas-works; and during the following years the details of the specification were considered along with the experience obtained in their use, but the advent of the war interfered considerably with the work, owing to the absence on active service of several members of the Committee. Nevertheless, steps were taken to ensure more active prosecution of research on important questions, rendered possible by a grant in 1916 made by the Council for Scientific and Industrial Research. In 1920 a Refractories Research Association under the ægis of the Committee for Scientific and Industrial Research was formed, and since that time the work has been carried on in association with it. By 1922 experience showed that considerable amendment was necessary to details of the specifications published ten years earlier; and they were issued in revised form in June, 1923.

The attention of the younger members of the Institution is called to these specifications, as they may be unfamiliar with them, and would find them useful.

Life of Gas Meters.

The modifications in carbonizing plant already referred to had their effect on the composition of the gas produced; and this, in turn, it was felt, might be a contributory cause of the trouble which was being experienced with gas meters.

Accordingly, in October, 1914, a Joint Committee of the Institution and the Society of British Gas Industries was appointed to investigate the various conditions affecting the life of gas meters; and during the next seven years carried out a very useful work. The preliminary work of summarizing and tabulating the replies to a questionnaire was ably done by the late F. G. Cockey; and in October, 1918, a report on the "Corrosion of Dry Gas Meters," prepared by J. G. Taplay, Chief Analyst of the Gas Light and Coke Company, and "Unaccounted-for Gas," by B. R. Parkinson, were submitted. As in the former reference was made to the corrosion of the metal parts of meters, this part of the subject received further attention, and reports on "Internal Corrosion of Mains Services and Meters" were prepared in May, 1919, and June, 1920, by J. G. Taplay. In the following years the Committee continued its investigations and presented a final report in June, 1922, which contained a résumé of the whole question of internal corrosion in relation to modern gas practice; the effect of vaporizing and spraying on the greases in meter stuffing boxes; maintenance of prepayment meters; and memoranda on the new standard sizes of meters.

It was altogether a very interesting and practical report; and their remarks that "inquiries made throughout the country clearly showed that dry gas meters were frequently seriously overworked, resulting not only in undue wear and tear, but also in defective registration, during periods of overload," are probably as true to-day as they were then, and are worthy of serious consideration in view of the recent improvements made in meter construction and the extending use of high-capacity meters. The embodiment in the Gas Regulation Act (1920) of a provision authorizing the Board of Trade to make regulations for the testing of meters was due to work done by this committee.

Wrought-Iron Tubing.

The matter of the quality of iron piping supplied to the gas industry was raised in 1923 by a letter addressed to the Technical Press by A. Stokes, of the South Metropolitan Gas Company; and in January, 1924, the Institution addressed a questionnaire on the subject to the gas undertakings in Great Britain and Ireland making 1000 million c.ft. of gas and upwards per annum. Reviewing the evidence from this inquiry, the Committee reported that it was evidently desirable that steps should be taken to ensure that gas barrel supplied to the industry be composed only of superior quality iron; and while strongly recommending the use of wrought iron only for tubing,

they directed attention to the deleterious effects arising from internal corrosion of all barrel, whether iron or steel, attributable to the presence of carbon dioxide, oxygen, and water vapour in the gas passed through, and suggested that all practicable steps should be taken to reduce to a minimum the amount of oxygen in the gas.

They then turned their attention to the drafting of a specification of the strip to be used, and the qualities of tubes and fittings, based on their research. This specification was subsequently adopted by the Institution, and, along with the list of approved makers of strip arranged by the committee, has proved a great help in the purchase of piping required in such large quantities by the industry.

GAS FOR THERAPEUTICAL PURPOSES.

In 1927 a representative Committee was appointed to help in the investigation of the use of gas for therapeutical purposes at the hospitals under the charge of Sir Henry Gauvain, at Alton; but it is too soon to expect results from the experiments which are being carried out there.

During the past year a new radiant for gas fires, which increases the amount of infra-red rays, has been put on the market. It provides a more penetrating, and consequently more comfortable, heat; and its effect as a curative power is being watched with great interest.

RECORDING GAS CALORIMETERS.

In view of the Report to the Board of Trade of the Fuel Research Committee as to the introduction of a calorimeter of a standard type capable of continuously recording the calorific value of the gas distributed, a Committee was formed in 1920 which carried out considerable investigation on this important apparatus. The delay in making the tests by the recording calorimeter penal, the reports of the Gas Investigation Committee in 1921 and 1923, and the lecture by Prof. C. V. Boys in 1925, have made any general report unnecessary; but the Committee continues to function, and recently was able to give considerable help to the engineers of undertakings who had been called upon by the Gas Referees to instal recording calorimeters.

EFFLUENTS AND AMMONIA.

The Sub-Committee on Effluents has been at work since 1927, and has already made its influence felt. Two interesting and instructive reports have been published; and its future work, along with that of the Ammonia Sub-Committee, will be eagerly watched.

I think that we may justly claim that the foregoing record of work done is no mean achievement, and that the activity during the last few years gives promise of greater results in the future.

Closely allied with the Institution are the British Commercial Gas Association, the National Gas Council, and the Society of British Gas Industries.

BRITISH COMMERCIAL GAS ASSOCIATION.

The importance of the cheap manufacture of gas can hardly be over-rated, and while efficient distribution and suitable appliances for its use must be provided, the need for systematic advertising of the advantages of the use of gas had for some time become apparent to many in the gas industry; and in 1910 the Council, having considered a suggestion of the Southern District Association, called a special meeting for April, 1911, to discuss the question of co-operative advertising, with the result that in October of that year the British Commercial Gas Association was formed. From the beginning success attended its efforts, and the advantage of general advertising in support of local publicity soon became apparent. Illustrations of high artistic merit and copy of good tone have always been a great feature, calling forth complimentary remarks from many quarters, including that of our friends who have goods to sell in competition.

The Association has been fortunate in having the services of F. W. Goodenough as Chairman of the Executive Committee since the inception of the Association, and the industry owes him a debt of grateful thanks for the work he has done so ably and unostentatiously.

In 1928 undertakings representing 95 per cent. of the gas sold were connected with the British Commercial Gas Association.

NATIONAL GAS COUNCIL.

In his Presidential Address in 1910, the late J. W. Helps asked the question, "Is our Institution fully representative of the gas industry?" and answered that in his opinion it was not. His suggestion of a Gas Institute divided into sections like the British Association did not, however, lead to any definite action.

In 1914 the late Edward Allen, of Liverpool, when President, endeavoured to obtain combined action by the formation of a National Gas Committee composed of twenty-one members—seven from the Institution, seven from the Society of British Gas Industries, and seven from the British Commercial Gas Association. This Committee was to deal with all matters of importance to the industry at large, and such matters could be referred to it by any of the three organizations. It was, however, felt that it was not sufficiently large or representative, and in 1916, at a Joint Conference of the Councils of the Institution and the Society of British Gas Industries, the General Committee of the British Commercial Gas Association, and the Committee of the Gas Companies Protection Association, the National Gas Council was brought into being. It has proved a very live and efficient body, and, embracing, as it does, all sections of the industry and representatives from municipal as well as company undertakings, can deal with all national matters affecting the industry, to the great advantage of the industry.

SOCIETY OF BRITISH GAS INDUSTRIES.

Reference must also be made to another Society closely allied to our Institution—namely, the Society of British Gas Industries.

The inception of this Society, founded in 1905, may be traced to an article in the "JOURNAL OF GAS LIGHTING" in December, 1904, by the late Editor, Arthur F. Bezant, in which he called attention to the desirability of forming an Institution of Gas Apparatus Makers.

The aims of the Society are advanced by research and investigation, and the maintenance of a high standard of production, while the spirit of co-operation extended to kindred associations such as our own has already borne good fruit, as will have been gathered from previous references to its co-operation on joint research committees.

I would take this opportunity of appealing for a more general use of the Standard Conditions of Contract which have been agreed by the Institution and the Society. They were first published in 1909, and have been revised from time to time. They are the result of much careful consideration; their terms are very fair, and should be more generally embodied in specifications prepared by members of our Institution than is the case.

JOINT FUEL COMMITTEE.

Before leaving this portion of the address, mention should be made of our association with technical bodies other than those directly connected with the gas industry. For dealing with subjects in common, a Joint Fuel Committee of representatives of the Society of Chemical Industry, the Coke Oven Managers' Association, the Institute of Fuel, and the Institution of Gas Engineers, is called when occasion requires; and the recent World Power Conference owed much of its success to the help of this committee. The Carbonization Conference at the British Industries Fair in 1928 is another example of its useful work, while for the World Power Conference to be held at Berlin in 1930 it is likely to be of further service.

FUTURE WORK.

Having taken up so much time in reviewing the activities of the Institution and its relation with other bodies connected with it, one naturally tries to visualize the lines of its future work, bearing in mind its object in widening its doors and by applying for a Royal Charter. By their Articles of Association, the Institution is intimately in touch with the National Gas Council and the British Commercial Gas Association, besides having a large proportion of their membership in common. Each carries out the work which is its special purpose; but, while, when occasion has required, joint committees of the Institution and the Society of British Gas Industries have done much useful work, and our relations with that body have always been most amicable, there does not appear to be sufficient co-operation between the Institution and the different industries represented by them. How this may be accomplished is a subject worthy of careful consideration. One result of this want of closer working relations is the suggestion to establish a central laboratory by the Institution,

for the certification of suitable appliances for using gas. The argument is that, while the larger undertakings have facilities for carrying out tests on apparatus submitted for purchase, and are able to discriminate as to which are suitable, the smaller undertakings are not able to do this, and may provide for their consumers appliances which may bring discredit to them, and eventually on the use of gas. Little good can come of general suggestions of this description. In the main the apparatus made by makers of repute in this country is usually the result of careful research carried out in the makers' laboratories; and if those desiring specifications and tests of any specific apparatus would notify the Council of the Institution of their requirements, there should be no difficulty in arranging for a properly qualified and representative committee to deal with it. Incidentally, in these days of urgent requirement of suitable men to serve on such committees, engineers should, I think, be urged to encourage their assistants, and members of their staffs specially qualified, to be placed on these committees.

EDUCATION.

On the subject of education, though interesting and extensive development has taken place in recent years, our forefathers were not unmindful of its necessity, for we find that the Royal Society of Arts held technological examinations from the year 1873, and that gas manufacture was one of the subjects. When the City and Guilds of London Institute took over the technological examinations in 1879, the subject of gas manufacture was retained, and later extended to Gas Engineering and Gas Supply, while in 1915 the subject of Gas Fitting was added.

The first step towards an Education Scheme for the Institution was taken at the Annual Meeting in May, 1919, when Prof. A. Smithells opened a discussion on "The Education of the Gas Engineer," in which he made a strong appeal for greater use to be made of the Universities for scientific training of those entering the gas industry. The speakers who followed, while agreeing with the advantages of knowledge gained in this way, recognized that it was not available for the major proportion of the class from which recruits would be drawn, and a Committee was appointed to consider suggestions for a revision of methods of education and examinations in the industry. Conferences were held with representatives of the Board of Education and the City and Guilds of London Institute; and after prolonged consideration and full discussion in all districts, a "Scheme for the education and certification of those engaged in the technical work of the gas industry, and for making arrangements for giving effect to it," was submitted at a special meeting of the Institution in February, 1923. This was unanimously adopted. A perusal of the Scheme shows that the Committee had been deeply impressed with the necessity of providing a scheme for education, as opposed to one for examination only, as it provided for group courses at various centres, where instruction would be given in Mathematics, Physics, Chemistry, and Engineering, in addition to the main subjects of Gas Engineering and Gas Supply. The Scheme had received the full endorsement of the Board of Education, and their assistance would be available in arranging the classes at the various centres. Those attending these courses would be known as internal students, and the examinations in the ancillary subjects would be carried out by the Education Authority; that in the main subject being conducted by a Board of Examiners appointed by the Institution. Recognizing that it would not be possible in all cases for students to avail themselves of the opportunity of attending these grouped courses, provision was made for external students who could give proof of education to the required standards in the ancillary subjects to obtain certificates of equal value by taking the examinations in Gas Engineering and Gas Supply.

Certificates were provided for three Grades—Ordinary, Higher, and Diploma.

The first year (1924) was largely one of foundation building, consisting in inducing local technical institutes to interest themselves in the Scheme; in interesting the junior members of the staffs of the undertakings in the country in the Scheme by a series of conferences of the Junior Gas Associations throughout England and Scotland at which the Scheme was expounded by the Organizing Secretary, Mr. Walter Hole; and in the consideration, and in many cases the amendment, of the courses of study prepared by technical institutes. The result was that by the end of that year twelve centres had been arranged for internal students, while arrangements for examination for external students had been made at a further twelve centres. The number taking the examinations was sixty. The year's experience revealed the need for extension of its scope in a downward direction, there being many in the industry who were anxious to improve their technical knowledge, but who were, either through lack of suitable educational opportunities or attainments, or other causes, unable to avail themselves of the Scheme; and in the following year (1925) arrangements were made with the City and Guilds of London Institute to eliminate overlapping by the establishment of Minor Group Courses in Gas-Works Practice and Gas Supply Practice, and the adoption of grouped courses for gasfitters. Liaison with the Universities was also established, and a graduate possessing the approved degree in Gas Engineering, taken in a British University, was arranged to be exempt from the written portion of the Diploma examination.

By June, 1927, there were 30 technical institutes with approved courses; and the first Teachers' Training Course, arranged at the suggestion of, and through the good offices of, the Board of Education for the benefit of teachers in Gas Engineering and Gas Supply, was held in London.

Early in 1927 a Memorandum was presented by all the Junior Associations, except the West of Scotland, reviewing the working of the Scheme from its inception, and expressing dissatisfaction with it. They pointed out the lack of definite standards required in the ancillary subjects, and complained of the requirement that potential students qualified to a greater or less degree in one or more of the ancillary subjects should be compelled to put in at least 150 hours attendance during the session; and that owing to the geographical distribution of the potential students, those residing in less favoured districts were deprived of the opportunity of qualifying for examination in the ancillary subjects. Also, owing to the paucity of properly equipped technical schools giving instruction in ancillary subjects to the standards required by the Higher-Grade Examination, and the very meagre relaxations offered to the external students, it was impossible for two-thirds of the students in the industry to take part in the Scheme. Unless considerable modification could be introduced, they could see no prospect of the Scheme being successful or of fulfilling the purpose for which it was inaugurated. They suggested as an alternative that the Institution should set up a Scheme of examinations, in both ancillary and main subjects, at one or more centres throughout the country, and, to carry this out, that definite standards should be decided for each grade of the course, and that no restriction or condition should be made as to the source from which the student received his instruction or how he had acquired his knowledge.

The Memorandum of the West of Scotland Junior Gas Association agreed that the existing regulations made it practically impossible to meet the needs of each individual student, particularly those situated in isolated districts, and suggested that the avenue of approach for external students should be made much wider. In Scotland, while there were only four centres where it was possible to obtain tuition in the ancillary subjects to the standard necessary for the Higher Grade Examination, there were a number of affiliated schools where instruction to a lower standard was provided; and they suggested that, under Section 2 of the Scheme, students should attend the nearest affiliated school where tuition could be obtained in any three of the ancillary subjects, and if the certificate granted by that school in any particular subject was not of equal standard to that of the approved centre, the student, after due preparation—say, by private tuition—should be allowed to sit at the final examination in that subject set by the Central Institution. In the case of students who, either from geographical position or due to exigencies of their service, could not attend suitable classes regularly, that they should be allowed to receive their tuition (say) under the guidance of a qualified teacher, and, by arrangement with the heads of qualified schools and Central Institutions, sit for the examinations mentioned above. They further suggested that the Junior Associations should have direct representation on the Local Advisory Committee.

A conference was held in London on March 9, 1927, of the Advisory Education Committee, Board of Examiners,

and Committees of Advice for Scotland and Wales with the Junior Gas Associations of the United Kingdom; and subsequent discussions took place. As a result, several modifications were made. District Education Committees, composed of representatives of District Associations, Junior Associations, and the Education Department, with the Organizing Secretary, as an ex-officio member, were appointed, who through their local knowledge of the educational facilities available would be able to advise students where to obtain instruction, and influence the Local Education Authorities to arrange for suitable courses. It was learned that the Education Department were most desirous to help; and in areas surrounding technical schools, where travelling facilities made attendance at evening classes difficult and inconvenient, if a number of gas undertakings would co-operate in releasing would-be students from employment at least one half-day a week, they would be willing to make arrangements for their proper instruction. Where the greater technical schools could not be taken advantage of, arrangements might be made for the smaller technical schools; and in the comparatively rare instances where no technical school was within reach, the secondary schools could be utilized. In special cases the District Committees were authorized to arrange for the special tuition of students in ancillary subjects where the general instruction at either the technical or the secondary schools did not reach the prescribed standards, and to provide for their examinations in those subjects either at the school where they had received instruction or at the nearest technical school.

It was hoped that these arrangements and the active sympathetic co-operation of District Committees with the Local Education Authorities would greatly increase the number of schools at which students desiring to enter under Section 2 could obtain the necessary instruction in the ancillary subjects.

General inquiries showed that the foregoing development was appreciated, but that time was necessary for it to get into proper working order.

It therefore came as a surprise when, at a meeting of the Southern Association of Gas Engineers and Managers in London in March this year, it was reported that a unanimous report had been received from the South-Eastern District Education Committee pointing out that in their opinion the Education Scheme, as at present constituted, had proved unworkable, and that there were many reasons for advising the Institution to constitute themselves as an examining body, and let students seek their own facilities for obtaining the necessary education. In the discussion which followed, many speakers supported this view; and a resolution was passed unanimously that the Scheme should be "modified in order to render possible the taking of the Institution's examinations by all properly-trained gas engineers and students in Gas Engineering and Gas Supply, irrespective of the methods by which they may have obtained their technical education." Such a resolution called for immediate action; and at the next meeting of the Gas Education Committee the question was fully discussed, and a Sub-Committee appointed to consider what steps could be taken to make arrangements for the examination of external students in the ancillary subjects. Eventually a scheme whereby this could be carried out, and several modifications of the existing regulations, were submitted to the Education Committee, and approved. Unfortunately it has not been possible to have the new handbook which is being prepared ready in time for this meeting, but the working out of the details is well in hand and the new arrangements can easily be available for next session. The chief modification is with regard to students who are unable to take advantage of the courses at approved centres, and these will now be able to be examined in the ancillary subjects to specified standard by examining bodies covering different areas of the country, without reference to the source of tuition. The examination in the main subjects of Gas Engineering or Gas Supply will be arranged to be held at the same time and places, and those who reach a sufficiently high standard in the main subjects for the Higher Grade will be required to pass an oral examination in both the ancillary and main subjects.

Being greatly interested in the question of the education of the younger members of the industry, and having been an active member of the Gas Education Committee for several years, I feel that I have a right to appeal for support of such a necessary object as the provision of suitable education. Apart from the necessity of examination as one of the qualifications for admission to the Institution, surely everyone will agree that it is one of our duties to provide opportunities for those on whom the future success of the Industry will fall to obtain suitable instruction. The Gas Education Committee was appointed for this purpose in 1923, and by co-operation with the Board of Education has succeeded in arranging 35 centres at which suitable courses are available at the technical schools and colleges. These have been much appreciated by students, but there are not yet nearly a sufficient number of such centres, and engineers are urged to use their influence with the Local Education Authorities for an extension of such facilities for the education of their staffs. It is recognized that, even when this is accomplished, there are still many students who are not in a position to take advantage of them; and it is hoped that the new arrangements for examination under Section 2 as external students will appeal to, and have the support of, those whose employees, who by reason of geographical position or other exigencies, are unable to participate in the advantages enjoyed under Section I. I would also appeal to those in scattered districts to co-operate in making arrangements for classes to be held during the day, and to grant facilities to those desirous of attending them. There are already a few such centres.

It should hardly be necessary at this period to stress the advantages of education; but I most strongly urge those in authority to use their influence with their juniors to make them realize the necessity of qualifying for advancement in life by the acquisition of knowledge. It is only by this means that we shall in the future be able to hold our own, and advance the work of the industry, which we have so much at heart.

The Organizing Secretary, Walter Hole, who has rendered such great service to the Education Scheme since its inception, now desires to retire from that position. We are sorry to lose his services, but grateful we have had them so long. The strenuous work which he did in the early days, in advocating and explaining the Scheme, and the services which he has since rendered, will long be remembered with gratitude by those who worked along with him; and the Education Committee are glad to announce that as he will continue to be one of their members his advice and experience will still be available.

GAS FROM THE CHEAPEST SOURCE.

Whatever the belief as to the dictum that "profits are made in the retort house," the sources from which gas can be obtained most cheaply must always be carefully considered. There have been departures from the ordinary systems of carbonizing in horizontal and vertical retorts; and recently vertical chamber ovens, inclined chambers, low-temperature carbonization units and complete gasification plants have been installed, the results from some of which it is hoped will show how the cost of production in gas-works can be reduced. Horizontal retorts still prove themselves a reliable method of manufacturing our main product. The steady increase in the therms made per ton suggests that the limit of their capabilities has not yet been reached; while extended experience in the use of silica and siliceous materials has proved their value in reducing the wear and tear cost of that important part of our plant. Vertical retorts make progress, and are being improved in their power to deal with various qualities and sizes of coal; while greater knowledge and experience in the application of the refractories used in their construction have enabled the important item of repairs to be steadily reduced. It is also claimed that their capital cost per therm is now as low as horizontals for large installations. The development of complete gasification plant moves slowly. There would appear to be a considerable field for its use with coals yielding coke of too high ash content to be suitable for sale; and plants to be a real help should be able to supply gas of reasonably high calorific value capable of being changed at will. Such a plant, which has been working experimentally at Mill Hill for some time, gives promising results, and is being extended by reason of its good service during the severe cold spell in February. Coke ovens in a district are a potential advantage, and, provided the gas can be purchased at a favourable price, may be a great benefit to a gas under-

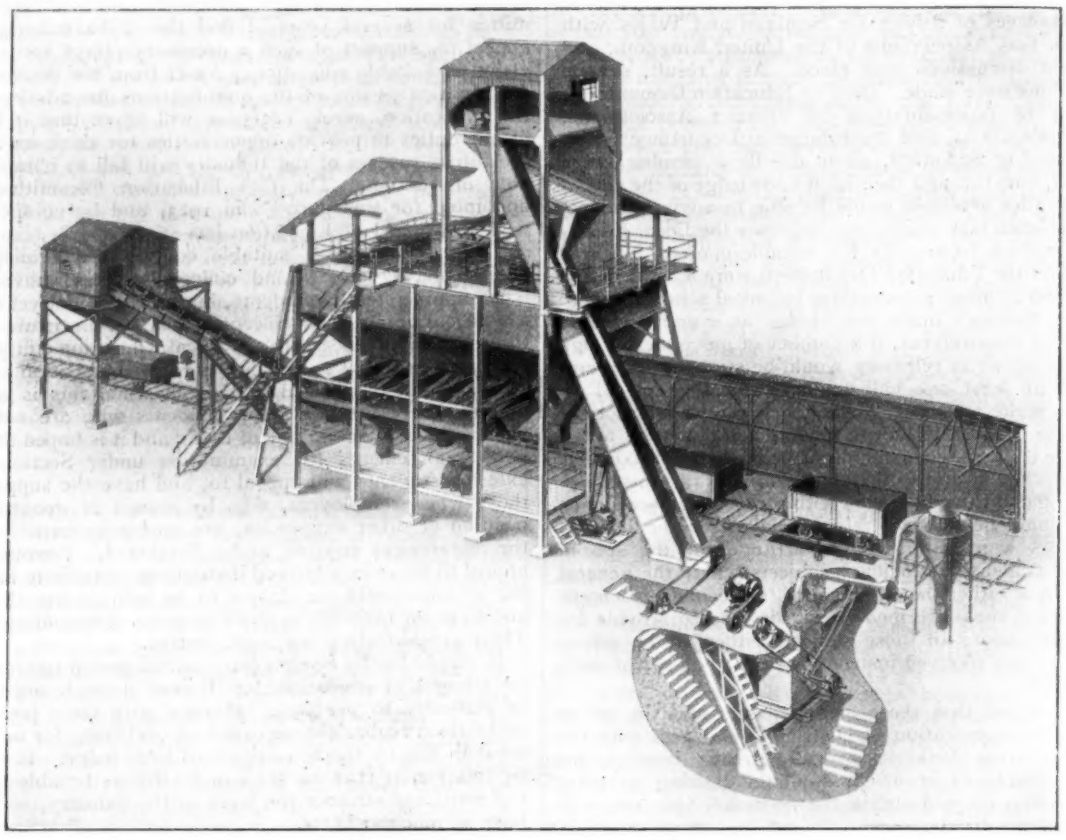


FIG. 1.—COKE SCREENING AND GRADING PLANT.

taking. The question as to what is a fair price to be paid for the gas continues to be a thorny one, but considerable progress towards an understanding has been made by the provision in agreements of clauses to obviate the discontinuance of the supply by reason of labour or other trouble in industries other than our own. Considerable publicity is given from time to time to the supply of coke oven gas to towns a long distance apart in Germany; but it is interesting to find, at the present time, even with our difference of opinion as to reasonable price barring the way to extension of its use in this country, that a larger volume of coke oven gas is being purchased and distributed at home than in Germany.

Carburetted water gas plants continue to be a great help in taking a considerable quantity of coke off the market; and great progress has been made in the design and working of the plant. The revolving grate has removed the arduous, and at times difficult, operation of clinkering; waste-heat boilers make the plant independent of the ordinary works steam supply; and automatic operating gear reduces labour to a minimum and makes possible cycles of operating desirable from a gas-making point of view, but difficult to perform by hand.

Low-temperature carbonization plant has now been installed by the Gas Light and Coke Company and the South Metropolitan Gas Company, and the opinion frequently expressed that gas undertakings were antagonistic to this form of carbonization has been countered. Whether it will prove of commercial value to deal with coal in this way at gas-works will now be demonstrated; and the thanks of the industry are due to those companies for the action they have taken. Another method of obtaining cheaper gas, especially for the smaller companies, is that of obtaining a supply in bulk from their larger or more favourably situated neighbours. Amalgamation is often not desired, and there should be no difficulty in drawing up agreements to safeguard the interests of both companies, effecting considerable economies and advantages. An extension of such an arrangement would seem to make possible the working of a gas grid, without interference with the rights and privileges of the smaller companies, and without removing the advantage of local interest and control.

Residuals Disposed of to Best Advantage.

The price at which gas can be sold by most well-conducted undertakings depends greatly on the cost of coal, or, more correctly, the net cost of coal (*i.e.*, coal *less* residuals); and it is not surprising that strong efforts are being made to enhance the value of coke for disposal, by breaking and grading it to sizes suitable for a considerable variety of boilers on the market for providing hot water supply for domestic purposes. Coke available for this purpose varies in its suitability by reason of its size, physical character, and percentage and nature of ash; and while these must vary according to the quality of the coal used and the type of carbonizing plant, there would appear to be little excuse for delivering to a customer coke containing an appreciable quantity of dust or an excessive amount of moisture. The engineer must realize that the standard demanded to-day is very different from that of a decade ago, and that competition with the supply of coke oven coke made from cleaner coal than he is able to purchase with advantage, in markets previously supplied solely by gas-works coke, has to be met. More requires to be done in the removal of slate and shale, and in improving the appearance and utility by careful sizing. The quantity of water for quenching coke from horizontal retorts needs careful regulation and intelligent control; and it is not surprising that attempts are being made to cool coke by other means. The recent installation of the Sulzer process at the Burnley Gas-Works will doubtless be watched with considerable interest; but it is somewhat disappointing to learn that coke so treated does not ignite so readily as that quenched in the usual way.

Coke is not easily broken to the sizes now required without making an unduly large proportion of breeze; and even with the present variety of breakers on the market there is plenty of scope for those of inventive capacity to devise an improved type of breaker. Screening and grading plants vary greatly in design and efficiency, and an illustration of the most recent installation at the Sydenham Works of the South Suburban Gas Company may be of interest. It is shown in Fig. 1. Unscreened coke from stock, or coke of larger sizes—for which there is not a

pressing demand—from other screening plants is fed by truck to an underground four-roll breaker of the cutter type, capable of breaking 20 tons per hour to pass through a 1½-in. square mesh with 50 per cent. capable of passing ¾-in. mesh. The coke is then elevated to reciprocating screens; all over 1½-in. size being immediately returned through a secondary breaker to the boot of the elevator. The breeze is separated, and the coke is screened to the sizes required, and accommodated in hoppers provided for that purpose. Thence it can be loaded into railway wagons or into sacks for road delivery, after passing over secondary screens to remove any fine dust which had not previously been separated.

Having prepared an article of high grade, it should be possible to obtain a greater share in supplying the fuel for the domestic grate; and the time seems ripe for encouraging the fixing of suitable grates for this purpose. The type advocated with success by the South Metropolitan Gas Company, and named the "Metro" coke fire, is doubtless familiar to many; but, for those who are not conversant with its design, an illustration is given in Fig. 2. It is readily adapted to existing grates; and the convenience of the provision for lighting—by means of a gas burner suitably accommodated in the front of the

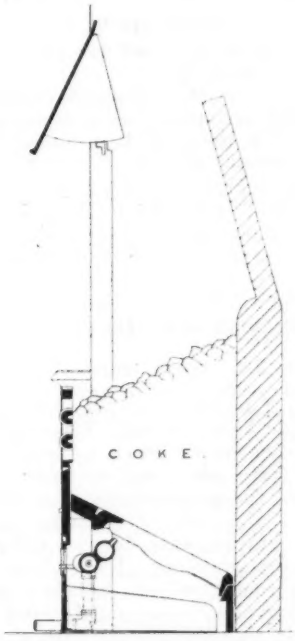


Fig. 2.—"Metro" Coke Fire.

fire, and only requiring the turn of the tap and the application of a light—will be readily appreciated. The following table compiled from information given by Dr. Margaret Fishenden in a paper at the World Power Conference last year should prove useful in propaganda for the sale of coke.

Comparative Costs of Heat Radiated by Different Fuels.

Coke	1
Low-temperature coke	1¼
Coal	1¼
Gas	3
Electricity	5

Gas Storage.

The provision of adequate gas storage is admittedly an expensive item in the capital of a gas undertaking; and it is not surprising that trials should be made of holders of designs differing from what had become standard practice. During the year, a considerable number of waterless holders of the "M.A.N." type have been erected in Great Britain, of capacities up to 8 million c.ft.; and there is now in course of erection one of the Klönne type. Reliable information of the comparative cost of these Continental designs and holders of British design would be a valuable contribution to the knowledge of those contemplating extension of their storage. Initial cost is not, however, the only consideration; reliability, upkeep, and longevity are items which cannot be overlooked.

The storage of gas under pressure is another departure from the beaten track; and as particulars of such an installation are to be given in a paper to be read before the Institution this week, there will be an opportunity for an exchange of views on this method.

The inquiry into the gasholder disaster at Manchester did not, unfortunately, bring out any useful indication of the cause; and a Sub-Committee of your Institution appointed to watch the proceedings in the interests of the gas industry, and afterwards to report on the design and maintenance of gasholders, find that the subject is fraught with such difficulty that it would be undesirable to frame any general recommendations.

Distribution.

The provision of an adequate supply of gas at an even pressure whenever required yearly becomes a more difficult problem. Mains which were laid (say) forty years ago to give a supply to the consumers for lighting only, by flat-flame burners, when pressure of a few tenths was adequate, are now called upon to provide larger volumes at a minimum of 2 in. pressure; and the fact that by the various expedients adopted the peak loads due to heating and cooking are dealt with as fairly successfully as they are shows a wonderful elasticity. This is fortunate, for even now the capital expended on mains is steadily becoming a larger proportion of the total capital expended, and seems likely in the future to be more so. One point which is sometimes overlooked, however, is that it is not sufficient to provide a supply of gas to a consumer at a certain minimum pressure, but that too great a variation in pressure may cause considerable dissatisfaction. This condition is to be discussed at some length in a paper at these meetings under the title of "The Incident of the Peak Load," and it is hoped that a useful discussion will ensue.

Dry Gas.

Before leaving the important subject of distribution, some mention should be made to the adoption of treatment to obviate the formation of undesirable deposits in the mains and service pipes. Reference has already been made to the desirability of reducing to a minimum the carbon dioxide, cyanogen, and oxygen in the gas sent out; and it is now common practice, at any rate for the larger undertakings, to remove the whole of the naphthalene. Recently, plant has been installed to remove the water vapour, which proves such an accessory to the action of the undesirable constituents; and it is claimed that a significant reduction in the number of complaints due to these causes has resulted. It is also found that a reduction of the moisture greatly facilitates the removal of naphthalene in scrubbers using oil for this purpose.

Public Services and the Use of Roadways.

The problem of the expense and inconvenience to all concerned of the breaking-up of carefully made roads is a very real one, and, while legislative restrictions should be avoided wherever possible, there would appear to be need for action to be taken on the question of accommodation for pipes and cables in roadways.

One is continually hearing of the iniquities of the various public service authorities in breaking up roads the re-making of which has only recently been completed, and while much of the trouble is the result of what has been done in the past, and due to the fact that it is now often impossible to find a position for a new main which would obviate that complaint, there does not appear any good reason why the faulty actions of the past should be repeated in the present to make trouble in the future.

In October last R. W. Edwards, of the Aldershot and District Light, Heat, and Power Company, in a series of able articles in the "Gas Journal," gave his views on the difficulties being imposed on gas undertakings by the use of reinforced concrete roads; and whether or not one agrees with his dictum that "the whole question of the laying of mains and cables in the highways should be thoroughly investigated, and remedial legislation pressed for," almost everyone would desire that something should be done in the matter. Mr. Edwards dealt largely with new roads of "arterial road" dimensions, where room in the verge can be allotted to the use of public service authorities; but there is a need for some

action to be taken in roads of normal widths now being developed, and those being formed in new housing estates. The position in the roadway or footpath allocated to the public service authority by the local surveyor should be settled on some more definite considerations than that of expediency at the moment. For instance, one wants to lay a supply main in the footpath in front of some houses being erected, and finds it is not possible, because at some time in the past the water company has laid a large trunk main there, and the Post Office have filled in the remaining space with trunk telegraph and telephone cables. Or one is asked to lay an 18-in. diameter feeder main in the footpath, to avoid breaking up the main road. The latter is very acceptable at the time, and it probably avoids heavy road reinstatement and unpleasant remarks from the public about breaking up a good road and interference with congested traffic; but it is only shifting the burden to some other user in the future. One is the fault of the surveyor in the past, and the other of the surveyor of to-day; and no doubt each had the same object—namely, saving of expense and trouble.

In 1904 my old Chief, A. E. Broadberry, of Tottenham, read a paper before the Institution on "Roadways; their relationship to the various Public Services," which might be read with much profit by Borough Surveyors to-day. It advocated the placing in the roadway of those pipes and ducts to which there was least need of access; leaving the footpath for "supply mains" of gas and water, and cables for electricity supply and for telephones, for which there would then be ample room. Some such course is all the more necessary now that many of the comparatively unimportant streets are being formed of reinforced concrete. Surely it is not too much to expect, in these days of conjoint conferences with different public service bodies, some simple, but none the less effective, allocation of position in the footway to those public bodies providing the services demanded by the householders. It will be argued, of course, that a supply main on each side of the road is expensive; but even with the post-war spacing of houses, the expense of double mains and short service pipes is little more than a single main and long services, if reinstatement of road and footpath has to be paid for, while the modern method of developing a housing estate by forming the carriageways of reinforced concrete before the building of the houses is commenced renders the latter method quite impracticable. It should also be borne in mind that short services make it easier to give that very desirable regular pressure required for complete satisfaction; and the liability to corrosion, and the expense of laying service pipes, are considerably reduced. In developing country districts where the scarcity of houses makes a double main unthinkable, a main in the footpath on one side of the road, with long service pipes to houses on the other side of the road, can be used, and these services transferred in the future when the other main is laid, which may with advantage be of larger diameter. The question then arises as to what diameter main should be allowed to be laid as a "supply" main as distinguished from a "feeder" main; and it is submitted that 8 in. should be the limit for those using diameters increasing by even figures, and 9 in. diameter for those using odd number sizes. The ordinary development would be the laying of a 4-in. main (or 6-in. if of considerable length) in one footpath, and, as the number of houses increases, a similar main in the other footpath, each acting as both feeder and supply mains; while at a later date, when the district has developed sufficiently, a "feeder" main of larger diameter would be laid in the roadway. The improvement in modern road surfaces by the use of tarring and carpeting and reinforced concrete brings in its train fresh difficulty for the gas engineer in the discovery of leaky joints and cracked mains, by reason of the impervious surface thus created. Recently special devices have been invented, which allow escaping gas to reach the surface through a protective gauze, and provide means for detecting escapes before these become too serious; and their utility will be watched with interest.

Gas for Lighting.

It is perhaps unfortunate that the cooking and heating load has proved such a profitable addition to gas undertakings business, as it has diverted attention from the lighting load which in most cases is still the mainstay of our undertakings.

The advantages of the use of gas for lighting in the house do not appear to be sufficiently advocated; and greater efforts should be made to maintain and extend its use in that field. Students at educational classes should also be impressed with the necessity of knowledge of the fundamentals and application of scientific illumination. These are necessary even for domestic lighting, where in many cases the desire for artistic effects predominates over efficiency and utility; but much more so for industrial and street lighting.

There is also need of the services of the properly qualified younger members of our profession in the associations connected with illumination, such as the Illuminating Engineering Society and the Association of Public Lighting Engineers. Representatives of rival illuminants willing to take part in this work seem to be quite numerous; and I appeal to chiefs—many of whom have not themselves the time to spare—who have assistants devoting special attention to such work, to encourage these assistants to become members, and by this means help in maintaining the status of the gas industry. Otherwise our apathy may well, in time, prove greatly to our detriment.

The Late Secretary—Walter T. Dunn.

During the past year Walter T. Dunn, who served as Secretary since 1896, resigned his position owing to ill health. His long and valuable services have been much appreciated by the members throughout thirty-two years; and it is natural that they should desire to present him with some tangible token of their regard. A testimonial fund for this purpose has been opened, which it is intended to make representative by limiting the contributions to a nominal sum; and I take this opportunity of placing on record our appreciation of his long and faithful service, and to express the wish that his freedom from the cares of duty may effect such improvement in his condition that he will for many years be able to be present at the annual meetings of the Institution.

Conclusion.

In conclusion, I am conscious that there are many topics on which I might have touched. I have tried to show by way of encouragement the work we have already accomplished; and I have advocated the need of education to ensure that the rising generation shall be qualified for the great future which awaits our industry. Also I have endeavoured to suggest some lines for future development of our various organizations. I have honestly tried, during my year as your President, to help forward the work of our Institution; and I must shortly hand over that duty to my successor with the sincere wish that he may find it as congenial as I have done, and that he may be able to succeed where I have fallen short in my endeavours. Gentlemen, I thank you for all your kindness and help during the past year, and conclude with the wish that the year in which a Royal Charter was granted to the Institution may prove the beginning of still greater services to our industry.

APPENDIX.

INSTITUTION OF GAS ENGINEERS.

Reports of the Gas Investigation Committee.

No. 1.	Part 1.	Gas cookers, ring burners, and similar appliances.
	,, 2.	Lighting with low-pressure burners.
	,, 3.	Gas fires.
2.	Part 1.	Tests at the Uddingston Gas-Works using 400 B.Th.U. gas.
	,, 2.	Relative efficiencies in use of different grades of gas (continued from No. 1).
3.	Part 1.	Relative efficiencies in use of different grades of gas.
	,, 2.	,, ,, ,, ,, ,, ,,
4.		Efficiencies of processes for manufacturing gas. Tests on continuous vertical retorts at Uddingston.
5.		Recording gas calorimeter.
6.		Efficiencies of processes for manufacturing gas. Tests on blue water gas installation at the Adderley Street Works, Birmingham.
7.		Efficiency of processes for manufacturing gas. Tests on carburetted water gas plant with waste-heat boilers at the Windsor Street Works, Birmingham.

8. Fairweather recording calorimeter.
9. Aeration and air injection of burners. (Part 1.)
10. Experiments in the manufacture of blue water gas.
11. Aeration and air injection of burners. (Part 2.)
12. Waste-heat boilers on vertical retorts at Birmingham.
13. Part 1. Aeration of lighting burners.
,, 2. Determination of specific gravity of gases.
(Special) Standard methods of testing gas ovens.
14. Experimental Gas Plant at the University of Leeds.
15. Examination of products of combustion from typical gas appliances. (Part 1—Methods of Testing.)
16. Studies in carbonization. (Part 1—Influence of the size of coal.)
17. Examination of products of combustion from typical gas appliances. (Part 2—Gas Fires.)
18. Studies in carbonization. (Part 2—Size of coal and admixture of inorganic compounds.)
19. Examination of products of combustion from typical gas appliances. (Part 3—Free-burning flames.)
20. Studies in carbonization. (Part 3—Temperature; blending with coke and inorganic compounds.)

FUEL RESEARCH BOARD.

List of Technical Papers and Special Reports.

Technical Papers.

1. The Assay of Coal for Carbonization Purposes; Dr. T. Gray, J. G. King.
2. Report on the Simmance Total Heat Recording Calorimeter; Dr. T. Gray, A. Blackie.
3. The Efficiency of Low-Temperature Coke in Domestic Appliances; Dr. Margaret W. Fishenden.
4. The Carbonization of Peat in Vertical Gas Retorts.
5. An Apparatus for the Measurement of Specific Gravity of Gases in Small Quantities; Alfred Blackie.
6. Comparisons of Some Methods of Running Water-Gas Plant; J. G. King, J. Fraser Shaw.
7. Preliminary Experiments in the Low-Temperature Carbonization of Coal in Vertical Retorts.
8. The Steaming of Wigan Arley Coal in Vertical Gas Retorts.
9. Carbonization of Seaweed (as a preliminary to the extraction of iodine and potassium salts); J. G. King.
10. Carbonization of Coal in Continuous Vertical Retorts. (A South Wales Gas Coal.)
11. The Microstructure of a Coal Seam; J. Lomax.
12. The Heating of Rooms. (A comparison of the costs of different methods on the Basis of Warmth Comfort); Dr. M. Fishenden, R. E. Willgress.
13. The Domestic Grate. (An experimental investigation of the relation between the Design of a Grate and the Heat radiated into a Room); Dr. M. Fishenden.
14. The Enrichment of Coal Gas by the Injection of Oil into the Retorts during Carbonization.
15. Carbonization of Coal in Continuous Vertical Retorts. ("Holmside" (Durham) Coal with experiments on the Production of Coal Gas of High Calorific Value.)
16. The Primary Decomposition of Coal. (1) The Temperature of Initial Decomposition. J. G. King, R. E. Willgress.
17. Low-Temperature Carbonization—Vertical Retorts at H.M. Fuel Research Station. Dr. C. H. Lander, J. Fraser Shaw.
18. The Reactivity of Coke. (1) Standardized Method for the Determination of Comparative Values. J. H. Jones, J. G. King, F. S. Sinnatt.
19. The "Unsaturated Hydrocarbons" in the Gases from the Carbonization of Coal; A. B. Manning, J. G. King, F. S. Sinnatt.
20. The Thomas Recording Gas Calorimeter.
21. The Assay of Coal for Carbonization Purposes. (Part 2); J. G. King, C. Tasker, L. J. Edgcumbe.

Special Reports.

1. Pulverized Coal Systems in America; L. C. Harvey.
2. The Peat Resources of Ireland; Prof. P. F. Purcell.
3. The Coal Fire; Dr. M. Fishenden.
4. Tests on Ranges and Cooking Appliances; A. H. Barker.

REPORT OF THE COUNCIL FOR 1928-29.

The Council have pleasure in presenting to the Members their Report on the work of the Institution during the past year.

Royal Charter.—The Institution has been granted a Royal Charter, and this marks an important step in the progress of the Institution, for it affords ample evidence of the recognition of the value to the State of the work of Gas Engineers. By this grant of the Charter, the Institution becomes possessed of direct State authorization to carry on its beneficent work for the industry and community. The status of the Institution has thus been raised to the highest possible standard, carrying with it the obligation to see that the conditions of entry are made more stringent. Members of the Institution become Chartered Gas Engineers, a title which carries with it the recognition of the possession of thorough training and capacity and giving assurance of professional standing.

Membership.—The total membership reached 1400 by the end of the year 1928, due to the great number elected in the preceding twelve months. This increase added no less than 355 names to the register, but 67 were lost by death, resignation, or transfer, giving a net increase for the year of 288. In 1927 the net increase was 21, and in 1926 only 7. In the following table statistics are given relating to the various classes of membership, and for comparison the figures for the previous year are specified.

Class of Membership.	At Dec. 31, 1927.	Elected and Transferred in 1928.	Deceased, Resigned, and Transferred in 1928.	Total at Dec. 31, 1928.	Increase or Decrease.
Hon. life members	1	..	..	1	..
Hon. members	28	3	1	30	2
Members	842	128	32	938	96
Associate members	196	191	22	365	169
Associates	15	3	2	16	1
Students	30	30	10	50	20
Totals	1112	355	67	1400	288

Deceases.—Since the last Annual Meeting the Institution has lost from its membership roll by death many who have rendered valuable service in its work. Amongst them Mr. Charles Hunt (Past President) should be referred to specially as one who faithfully served the Institution in many offices and on its Committees. Mr. Alex. Wilson (Past President) also rendered great service to the Institution. Dr. F. Mollwo Perkins (Hon. Member) and Mr. P. V. Byrnes (Hon. Member and President of the Canadian Gas Association) should be mentioned as men who did good work in the interests of the gas industry. The other losses were:—

L. Askew	London	Member
J. T. Battersby	Ambleside	,,
H. Buckley	Windsor	,,
F. G. Cockey	Surbiton	,,
C. Dakin	Crossley Heath	,,
J. S. Dougall	Boston, Lincs.	,,
W. Fendick	Hemel Hempstead	,,
T. Grizelle	Holywood	,,
H. J. Hailstone	Rochdale	Associate Member
J. Hughes	Hoylake	Member
S. A. McMinn	Beckton	,,
S. Meunier	Stockport	,,
L. Monk	Harwich	,,
J. F. North	Stourbridge	,,
A. Reid	Brechin	,,
A. H. Richardson	Tottenham	Associate Member
E. C. Sayer	Ipswich	Member
S. Shadbolt	Southbank	,,
G. Swinburne	Milbourne	,,
W. E. Walton	Bishop Auckland	,,

Annual Meeting at Cardiff.—The Annual Meeting was held at Cardiff from 12th to 15th June, and was presided over by Mr. Henry Dacre Madden, M.Inst.C.E., M.I.Mech.E., Engineer and Manager of the Cardiff Gas Light and Coke Company. An official welcome was extended to the Members by the Lord Mayor of Cardiff, Alderman A. J. Howell, J.P., and by the Chairman of the Cardiff Gas Light and Coke Company, Mr. L. G. Williams. Those attending the meeting were provided with accommodation at the unveiling of the Welsh National War

Memorial by His Royal Highness the Prince of Wales, K.G. (Hon. Life Member of the Institution).

The "H. E. Jones London Medal" was presented to Mr. Thomas Carmichael, of Portsmouth, for his Paper on "Modern Carbonizing Economics as exemplified by Results and Working Costs at the Works of the Portsmouth Gas Company," read in London in June, 1927.

The following Papers were read and discussed:—

"The New Morriston Works of the Swansea Gas Company," by Mr. William H. Johns.

"The Economic Aspects of High Pressure Gas Distribution," by Mr. Stephen Lacey.

"Some Recent Alterations and Extensions in the Distribution System at Tottenham," by Mr. H. C. Smith.

"Some Applications of Chemistry in Gas-Works," by Mr. H. H. Hollings.

"Gas Supply East of Suez," by Mr. S. Barker Johnson.

Reports were presented on behalf of the various Committees and Sub-Committees, the outstanding ones being:—

19th Report of the Joint Research Committee of the Institution and the University of Leeds on "Products of Combustion of Typical Gas Appliances, with Special Reference to Carbon Monoxide."

20th Report of the Joint Research Committee of the Institution and the University of Leeds on "Studies in Carbonization. Part III.—Influence of Temperature of Carbonization, Size of Coal and Admixture of Sizes, and Additions of Coke Breeze and Inorganic Compounds."

2nd Report of the Effluents Research Sub-Committee.

Report of the Gas for Therapeutical Purposes Sub-Committee.

Report of the Wrought Iron Tubing Committee.

Report of the Gas Education Committee.

Report of the Refractory Materials Joint Committee.

Report of the Livesey Professor, J. W. Cobb, C.B.E.

Report of the International Commission on Illumination and of the National Illumination Committee of Great Britain.

National Gas Council.—The Institution was represented on the Executive Board of the National Gas Council by the President, Mr. John Terrace; the Senior Vice-President, Mr. C. S. Shapley; the Immediate Past President, Mr. H. D. Madden; and the Hon. Secretary, Mr. W. E. Price.

British Commercial Gas Association.—Mr. John Terrace, as President of the Institution, occupied the office of First Vice-President during the year.

Affiliated Associations.—In the year under review, the Affiliated District Associations were represented on the Council by the following members:—

Eastern Counties	J. B. Hansford, Bedford
Irish	L. W. Dalby, Wicklow
Manchester	R. H. Ginman, Leek
North British	J. W. Napier, Alloa
North of England	Dugald Currie, South Shields
Southern	C. Valon Bennett, Rochester
Wales and Monmouthshire	D. Walter Davies, Tredegar

General Research Committee.—A General Research Committee has been founded as the intermediary between the Council of the Institution and the various Sub-Committees dealing with research work. The scheme has been set to work, and now each Sub-Committee reports at comparatively short intervals to the General Research Committee on the work that is in progress, the general results obtained, and the proposed work for immediate attention. It is hoped by this re-organization to learn more of the work that is being done and to make the experiences of the members of the General Research Committee available to the workers in the various fields. Already the value of the scheme is shown by the suggestions of new work that should be experimented upon immediately.

In the course of this re-organization, the position of the Joint Research Committee of the Institution and the University of Leeds had to be reviewed, as it was not in the same position as the Sub Committees appointed solely by the Institution. Discussion of the position led to an amicable understanding, and thus the research work of the Institution can be carried on in such a way that the Council have the valued co-operation of Professor Cobb and the University of Leeds, and are kept in full knowledge of progress of the work.

Joint Committee of the Institution and the University of Leeds.—As was announced at the Cardiff Meeting of the Institution, Professor Arthur Smithells resigned the Chairmanship of the Joint Committee, and the office has been accepted by Mr. Thomas Hardie, Chief Engineer of the Gas Light and Coke Gompany. During the year the work on the products of combustion from typical gas appliances was continued as well as investigations on carbonization, ignition, and reactivity of cokes. Useful work has also been done in the study of the influences of temperature and size of coal on gas production and the actions caused by blending with inorganic compounds. Reports on these researches have been prepared and will be submitted to the Annual Meeting.

During the year Dr. A. Parker resigned his post as Research Chemist to take up the appointment of Assistant Director of Research upon Water Pollution. This resignation was received with great regret by the Council, who gave instructions to have placed on record in the Minutes their high appreciation of the most valuable services which Dr. Parker had rendered to the gas industry in his association with Professor Cobb and the University of Leeds.

In place of Dr. Parker, Mr. F. J. Dent, who formerly held the Gas Fellowship, was appointed to fill the vacancy.

Once again the Council wish to offer the thanks of the Institution for the valuable aid rendered by Mr. C. S. Shapley and the Leeds Corporation Gas Department for providing the facilities for the investigation work conducted at Meadow Lane Works.

Effluents Research.—The Effluents Research Committee under the Chairmanship of Mr. Charles F. Botley, is continuing its valuable work for the gas industry at Hinckley and Coventry, with the co-operation of Mr. Lee and Mr. Langford. Investigations on the use of electrostatic means for the removal of tar acids are now in full progress, and already there are indications that results of value will be derived from them, as will be seen from the Third Report.

During the year many inquiries have been made by gas undertakings regarding the treatment of effluents and, on the basis of the work already done, it has been possible to deal promptly with most of the questions submitted.

Dr. Parker having resigned after rendering most valuable help to the Committee, this research is now in the charge of Dr. Monkhouse, who has Mr. Etheridge (a former Gas Fellow) as his temporary assistant.

Ammonia Sub-Committee.—At the request of the Central Executive Board of the National Gas Council, the Council of the Institution set up an Ammonia Sub-Committee, under the Chairmanship of Mr. Charles F. Botley, to explore the present position and future prospects of the commercial production of sulphate of ammonia or other ammonia products in gas-works. As a preliminary to any possible definite research, it was decided to make a complete survey of all aspects of the problem. In this connection, one of the contributions submitted is thought to be of such practical value as to warrant immediate publication, and it is therefore embodied in the First Report of the Sub-Committee to be submitted to the Annual Meeting.

Refractory Materials Joint Committee.—This Joint Committee, with Mr. John P. Leather as Chairman, was set up by the Institution and the Society of British Gas Industries to deal with Refractory Materials in relation to the Gas Industry, and to work in association with the British Refractory Research Association. In the Report to be submitted to the Annual Meeting, abstracts will be given by Mr. A. J. Dale of all the recent work carried out by the Association which has definite relationship to gas-works practice. The work on thermal insulation has been continued, and papers on "Some Effects of Temperature on Heat Insulating Materials," by Messrs. Dale and Wheeler, and on "Experiments on Frothed Clays," by Mr. S. R. Hind, are incor-

porated in the Report, as is also a paper by Messrs. Dale, Swallow, and Wheeler on "The After Expansion of Silica Refractories for Carbonizing Plant." Some work has been conducted in the investigation of a case of Surface Flaking of Vertical Retorts. Other contributions to the Report include a note on "The Influence of Oxidizing and Reducing Atmospheres on Refractory Materials," and a study of "Jointing Materials for Silica and Fireclay Bricks."

Livesey Professorship.—The successful work of Professor J. W. Cobb, C.B.E., in the training of students for entry into the gas industry has been continued. The usual courses of lectures and laboratory work for the degree course have been held, and the research work of the Department of Coal Gas and Fuel Industries is still being carried on under the direction of the Professor.

Gas Research Fellowship.—Mr. F. J. Dent held the Fellowship until he was appointed Research Chemist in place of Dr. Parker. His report, in collaboration with Professor Cobb, entitled "Factors Influencing the Reactivity of Coke," will be submitted at the Annual General Meeting.

Scholarships.—The Council have to report the offer and acceptance of an additional Scholarship to be held by a student of Gas Engineering at the University of Leeds. The first scholarship was the gift of Sir Corbet Woodall, and has been awarded since the year 1916. The holder during the year 1928-29 was Mr. C. B. Bolland, of Batley, who is now completing the third year of his tenure. By the generosity of Mr. P. F. Holmes and Mr. D. M. Henshaw, the Institution was offered a sum of money sufficient to provide a Scholarship of the annual value of between £120 and £150 in memory of the late Mr. William Cartwright Holmes. This award is to bear the name "The William Cartwright Holmes Scholarship," and a Committee is being set up to settle the terms under which it will be offered to a suitable candidate, who proposes to enter upon his studies in Gas Engineering at the University of Leeds.

Education Committee.—A Report of the Education Committee, of which Mr. F. W. Goodenough is Chairman, will be presented at the Annual Meeting. The Council desire to express their thanks to the Examiners for their work in carrying out the onerous duties in connection with the examination of the younger generation of Gas Engineers.

During the year certain criticisms of the Education Scheme were brought forward through some of the District Associations, and after a general discussion by the members of the Committee of the criticisms that had been put forward, a small Sub-Committee consisting of Mr. Goodenough, Mr. Terrace, Mr. Briggs, and Mr. Robertson was entrusted with drawing up a revised Scheme. Success has attended their efforts, and the new Scheme has been accepted in principle by the Education Committee and by the Council of the Institution. These proposals will be reported upon to the Annual Meeting.

The Sub-Committee, with the addition of Mr. Creasey, H.M.I., has now been entrusted with the preparation of a booklet putting forward the Scheme in such a way that will make its requirements clear to those wishing to pursue the requisite studies either to obtain the qualifications for entry into the Institution, or to show that they have obtained a systematic education in Gas Engineering or Gas Supply.

British Industries Fair.—In connection with the British Industries Fair this year, a Gas Industries Section was organized by a Joint Committee of the Institution, the Society of British Gas Industries, the British Commercial Gas Association, and the National Gas Council. Mr. John Terrace and Mr. W. E. Price represented the Institution. In connection with the Fair, a very successful Joint Gas Conference was held under the Presidency of Mr. Frank H. Jones. Papers were read by Mr. R. J. Milbourne on "Gasholders," and by Mr. Stephen Lacey on "Gas Appliances: Testing and Maintenance." A lecture, at which Mr. John Terrace presided, was given by Dr. C. M. Walter on the gas heated industrial appliances in use in a series of works which were later visited. Mr. H. C. Smith was the Hon. Secretary of the Conference, which was so successful that it has been decided to hold a similar series of meetings in connection with the British Industries Fair this year. On the Joint Committee of the Gas Industries Section of the Fair for next year Mr. C. S. Shapley and Mr. W. E. Price have been appointed to represent the Institution.

Purifiers Committee.—The Federation of Gas Employers, having received a letter from H.M. Engineering Inspector of Factories dealing with matters connected with the suggested framing of regulations regarding the prevention of accidents with purifiers, asked for the assistance of the Institution.

A Committee under the Chairmanship of Mr. C. S. Shapley, was set up to make the necessary enquiries regarding methods of working and experiences, and a questionnaire was sent to all the gas undertakings in the country in order that exact information would be available regarding the matter.

When the replies are all returned, the information available is to be reported upon.

International Commission on Illumination.—Mr. Robert Watson represented the Institution at the Conference of the International Commission on Illumination, held at Saranac Inn, New York State, from the 22nd to the 28th September, when it was agreed that the next plenary session should be held in Great Britain in 1931. Mr. Watson will report upon the proceedings to the Annual Meeting.

Second International Conference on Bituminous Coal.—Dr. E. W. Smith represented the Institution at the Second International Conference on Bituminous Coal which was held at Pittsburgh from November 19 to November 24, 1928.

British Engineering Standards Association.—The representatives of the Institution on the various Committees were as follows:—

Sub-Committee 10/5.—Metal Tubes and Connections: Albert Stokes.

Sub-Committee 11/.—Pipe Flanges: Thomas Hardie and Albert Stokes.

Sub-Committee 11/2.—Flanges for Pipes of Large Diameter: Thomas Hardie and Albert Stokes.

Sectional Committee 16/.—Cast Iron Pipes: Thomas Hardie and Albert Stokes.

Panel 16/-/1.—Thicknesses of Cast Iron Pipes for Water, Gas, and Sewage: Albert Stokes.

Panel 16/-/2.—Spun Cast Iron Pipes: Albert Stokes.

Sub-Committee 16/2.—Cast Iron Pipes for Water, Gas, and Sewage: Thomas Hardie and Albert Stokes.

On Sectional Committee on Machine Parts, their Gauging and Nomenclature; Sectional Committee on Pipe Threads; and Sub-Committee on Steel Tubes: John Terrace.

On Illumination Committee, No. 39—

Sub-Committee 39/1.—Portable Photometers: J. G. Clark.

Sub-Committee 39/3.—Illumination Materials: Albert Stokes and John Terrace.

Sub-Committee 39/4.—Industrial Fittings: Albert Stokes and John Terrace.

Sub-Committee 39/5.—Street Lighting: Robert Watson, H. E. Copp, and J. Terrace.

Sub-Committee 45/.—Coal: C. M. Croft and W. J. Smith, B.Sc.

Some re-organization of the work of the Association has been carried out during the year, and various Industries Committees have been set up. Mr. John Terrace has been appointed to represent the Institution on the Mechanical Industries Committee.

Accounts.—A copy of the Accounts for the year ended 31st December, 1928, duly examined and certified by the appointed Auditors, Messrs. Wood, Drew, & Co., and Mr. A. E. Broadberry, is appended. It will be seen that the finances of the Institution are in a satisfactory condition.

Library.—The Council have to thank the donors of the books received for the Library during the past year. Volumes relating to the science of gas engineering are always welcome for adding to the collection of such books as are already available for reference and lending, subject to the regulations applying to the loan of books, a copy of which may be obtained from the Secretary.

JOHN TERRACE, *President.*

JAMES W. CAMPBELL, *Secretary.*

15th May, 1929.

THE SYDENHAM WORKS OF THE SOUTH SUBURBAN GAS COMPANY.

To be Visited by the Institution of Gas Engineers To-Morrow, June 6.

The South Suburban Gas Company—formerly called the Crystal Palace District Gas Company—dates back from the year 1854. In the year 1912, the Company purchased the undertakings of the Bromley and Cray, and the West Kent Companies; the Dartford Company was purchased in 1919; and the Northfleet Company in 1929. The area of the district of supply is now 175 square miles.

The land covered by the Works at Sydenham is 45 acres

Entrance to Works.

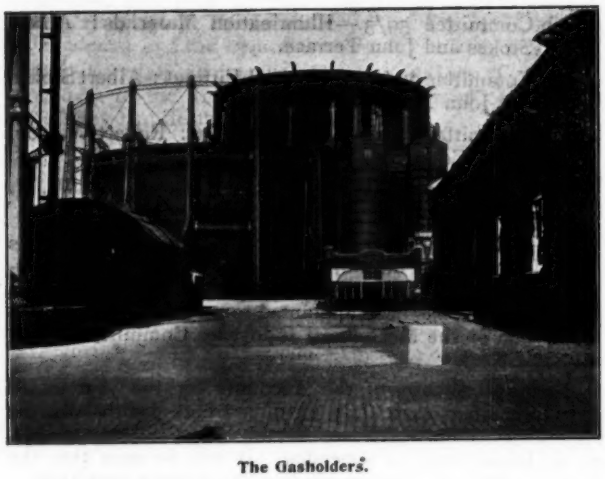
in extent. The total manufacturing capacity of the Sydenham Works per 24 hours is:

Coal gas	52,250 therms
Water gas	12,600 ,,
Total	64,850 ,,

The Company has works also at Bromley, St. Mary Cray, Crayford, Erith, Dartford, and Northfleet.

Carbonizing Plant.

There are four retort houses, three of which are now in use. No. 1 has a capacity of 80 tons of coal per 24 hours, and



The Gasholders.

contains 70 retorts on the inclined system, 21 in. by 16 in. at the upper end, and 24 in. by 16 in. at the lower end, by 20 ft. long, in ten beds of sevens, heated by furnaces on the regenerative principle.

No. 3 has a capacity of 360 tons per 24 hours. It contains 260 retorts on the horizontal system, 22 in. by 16 in. by 22 ft. long in 26 beds of tens.

The retorts are charged and discharged by Drakes machinery, worked by electricity generated in a central power station. The coke is removed from the house by means of an endless chain conveyor of the De Brouwer type, and passed through a screening plant, or on to the heap in the yard. The coal is brought in railway wagons, and mechanically emptied into an elevator, which raises it into overhead hoppers for feeding the charging machine.

No. 5 Retort House has a capacity of 290 tons per 24 hours. It contains 170 retorts on the horizontal system, 22 in. by 16 in. by 22 ft. long, and 60 retorts 22 in. by 16 in. by 20 ft. long. The latter retorts are tapered to the discharging end to 24 in. by 16 in. These settings, like those in No. 3 Retort House, are charged and discharged by Drakes machines.

The coke is removed by a De Brouwer conveyor, and passed through a screening plant before loading into trucks.

All the settings, 59 in number, have producers fitted with the "Sydenham" grate.

Gas made per ton	74½ therms
Total inerts	12 p.ct.
Coke made for sale	9½ cwt. per ton of coal

Coal Gas and Water Gas Purifying Plant.

In Section A of the works, the gas, after leaving the exhausters, passes through a tar separator, Walker purifying machines, Livesey washers, and finally a tower scrubber. In the Section B it passes through Livesey washers and tower scrubbers.

The gas from both sections then combines with the water gas before passing through purifiers containing oxide of iron. There are 23 of these, each 40 ft. by 22 ft.

The Power House.

Water Gas Plant.

The water gas plant consists of six sections, each of 750,000 c.ft. per 24 hours capacity. The plant includes three sets of turbine air blowers, three sets of exhausters, two hydraulic pumps, four Weir pumps, and various oil and water pumps.

Adjoining this building is the boiler house, containing four Lancashire boilers 8 ft. in diameter by 30 ft. long; and at the back are two meters, each of 100,000 c.ft. per hour capacity.

There are also two oil tanks, 60 ft. in diameter by 25 ft. deep, each having a capacity of 442,000 gallons.

Power House.

The power house contains two sets of reciprocating exhausters, each of 300,000 c.ft. capacity; and one set of 250,000 c.ft. capacity per hour, and one set of 500,000 c.ft. capacity turbo-exhausters; one air compressor for supplying power to the various parts of the works; one single-cylinder gas engine of 95 H.P.; one six-cylinder gas engine, coupled to dynamos for generating current for driving retort-house machinery; one 220 KW. generating set, and one 440 KW. set; and two Weir pumps, each having a capacity of 30,000 galls. per hour.

Adjacent to the power house are the condensers, washers, and scrubbers.

In the meter house there are four meters of a total capacity of 370,000 c.ft. per hour.

The total capacity of the gasholders is 7½ million c.ft.; the largest containing 3½ million c.ft.

There are three exhausters for pumping the gas to the Bromley holders, and from there onwards to the outer stations.

The sulphate of ammonia plant is capable of manufacturing 7 tons of sulphate per 24 hours.

The water required for domestic and other purposes on the works is obtained from the Pool River and two artesian wells. The water is pumped into tanks at the top of the water tower, which is 85 ft. above ground-level.

The transport fleet of 62 vehicles is housed in a central garage with workshops attached for carrying out all repairs.

SHOPS AND LABORATORIES.

There is a large shop for storing and repairing gas fires and cookers.

Adjoining the stove repairing shop is the firebrick works, where the whole of the firebricks and blocks used in the works are made.

The laboratories consist of general analytical, research, library, statistical, and microscopical sections.

There is a large building for testing and repairing meters, and shops for the fitters, blacksmiths, and carpenters.

There are seven governors controlling the Crystal Palace district, all of the Parkinson water-loading type, and automatically controlled.

COKE GRADING PLANT.

Near No. 4 Retort House is the coke grading plant. Large screened coke is brought from the retort house screening plants, and is here crushed and graded according to demand. The grades are double screened; the final screening taking place between the hoppers and the trucks or the bagging hoppers. All dust is removed while crushing, and collected in a conical chamber from which it is discharged periodically. The capacity of the plant is 20 tons per hour.

Number of employees	1,987
Coal carbonized last year	241,735 tons
Oil used last year	436,136 galls.
Gas produced	20,722,344 therms
Coke produced	150,514 tons
Tar produced	2,441,456 galls.
Liquor produced	6,808,473 ,,

THE GERMAN GAS AND WATER EXHIBITION, BERLIN, 1929.

April 19 to July 21, in the Kaiserdamm Exhibition Halls.

By DIPL.-ING. FR. ALBACH, of the Berlin City Gas-Works Company.

[Translated from "Das Gas- und Wasserfach," April 27, 1929.]

It was at the Annual General Meeting at Kassel in June, 1927, that the German Gas and Water Association resolved to hold the Exhibition, in conjunction with the special department of the Berlin Municipality which has for its object the organization of exhibitions, fairs, and entertaining. Representatives of technical, scientific, and industrial bodies from every part of the land, with invaluable assistance from the officials concerned, have worked together to realize, within the scope of an exhibition, a true and interesting picture of gas and water in their proper light as corner-stones in modern society. Innumerable experts in every sphere have worked in committees towards the perfection of every detail. To the main divisions of gas and water is added a third for miscellaneous subjects, in which such matters as organization of labour, prevention of accidents, education, and literature are dealt with.

In these days of so many superlatives, the claim that this huge show is the world's greatest exhibition of the year may seem commonplace. As a matter of fact, it is indisputably the largest popular technical undertaking of its kind which the world has yet seen. Even to-day, after nearly two years, the Raw Materials Exhibition held in Berlin in 1927 is fresh in the public mind. The world Press, at that time, proclaimed that there never had been anything so well organized, so interesting, and of such instructional value for the public at large. The present Exhibition is without question a still further advance, not only in magnitude, but, in its own special sphere, in sheer merit as an exhibition.

The Scheme of the Exhibition.

Not one, but all four of the halls on the Kaiserdamm have been taken into use, comprising, with the land attached, a ground space of some 45,000 sq. metres (over 11 acres). Acting on the sound principle that technical subjects are no longer the domain of a narrow interested circle, but are the concern of all, and for the common good, the Exhibition aims at offering something out of the ordinary. A serious effort has been made to avoid the customary show of inanimate objects in serried, but orderly ranks, and to substitute wherever possible a display of working processes, showing gas and water in all stages of their preparation and their everyday functions. Model workshops for industry and handicraft, model household installations, will be seen on every side, and by actually functioning will do their part in instruction and propaganda. Naturally, in catering thus for the general public, the specialist and the scientist have not been neglected, and in a special section devoted to their requirements there is collected a display which can never have been equalled.

Hall No. I.

From the railway station Witzleben, there is direct access to the largest of the exhibition halls, which, with a floor space of 16,500 sq. metres (180,000 sq. ft.) comprises the following sections:

I. Science and discovery in the gas industry;
II. Raw materials of gas manufacture;
III. Lay-out of gas producing plant;
IV. Gas manufacture;
V. Purification and measurement;
VI. Distribution; normal and high-pressure;
VIII. Corrosion;
IX. Laboratory work.

Model of a Gas-Works.

At the entrance to Hall No. I. there is on view the largest model ever seen of a modern gas-works, shown by the Berlin City Gas Company. It can really hardly be described as a model. On a ground space of over 10,000 sq. ft., it presents, on a one-tenth scale, the whole process of gas production in a works of 100,000 cub.m. [3½ million c.ft.] per day.

DR. H. SCHÜTTE,
Manager of the Bremen Gas-Works.
President of the German Gas and Water Association.

Dr. Schütte was born at Bremen in 1870, and after completing his studies in technical chemistry at the technical universities of Hanover and Erlangen he was engaged for some time in chemical laboratories. In 1899 he was appointed Technical Assistant at the Municipal Gas-Works of Bremen, of which he was appointed Chief in 1902—a post which he still holds.

On one side of the hall next to the model gas-works is given an introductory display showing the importance of gas in the national economic life.

Coal.

There follows, briefly and popularly illustrated, the story of coal. It is seen how coal is won and prepared for the market,

and how it is tested for its suitability for gas and coke making. Of great instructional interest, even to the housewife, is a demonstration of the processes of gas combustion, and its connection with the construction of burners and apparatus generally.

On the other side of this hall are the—

Exhibits of Various Cities.

Specially represented are the administrations of Berlin and Vienna, of Hamburg, Bremen, Lübeck, and the South-West German Gas Company. There are also exhibits from Stuttgart, Munich, Nürnberg, Cologne, Düsseldorf, Mainz, Hanover, Altona, Rendsburg, Breslau, Elberfeld, Gera, Delmenhorst, Chemnitz, and Kassel.

Other cities are showing distribution systems, and especially—

High-Pressure Distance Distribution Plant.

In the rest of this hall the side of the industry interested in the manufacture of gas-works and distribution plant displays its products. Here, for instance, can be made an examination of the interior of a modern gas-works oven, and the exact construction of every type of plant can be seen. Very striking examples of full-size carbonizing plant are shown by the firms Stettiner Chamotte-Werke vorm. Didier, Pintsch und Dr. Otto, and Koppers, and the Bamag Company show their latest water-gas plant.

Purification.

Various processes are to be seen actually at work, as well as meters and governors of all kinds. Here also are exhibits showing what is being done in the way of training officials and men in the industry, and all that is latest in welfare work. The Bernfsgenossenschaft (Trade Guild) of German gas and water works have a stand, where they show many interesting details of safety measures for the protection of workmen.

A novel addition to the gas-works apparatus is a plant, which can be seen working, for the—

Recovery of Gas from Waste Liquor.

Also is demonstrated a process for abstracting phenol from gas-works and coke-oven effluents. The Rütgerswerke Company has a particularly comprehensive exhibit showing the by-products of coal distillation and their recovery. A film in colours is used to illustrate the production, preparation, and employment of coke. The many uses to which the tar products can be put are well displayed, including road making, and the practical applications of pitch, benzole, and the innumerable derivatives, whether as dyestuffs or solvents, for perfumery or medicinal purposes.

At the end of this hall, all appliances for gas distribution are systematically grouped—pipes, mains, meters, and pressure regulators.

Of particular interest to the scientist is a wonderfully appointed—

Model Laboratory.

Here may be seen every requisite for gas-works testing purposes. A very instructive display is that devoted to corrosion, in which are shown every kind of damage which it is liable to cause in street mains, works, or houses, and every known means of combating it. Next a model office gives, for the first time, a practical public demonstration of a system of

Bookkeeping and Accountancy

which the German Association has evolved from long experience, and adjudged as of the highest value to the industry.

Hall No. II.

This hall, with a ground area of about 13,000 sq. metres [140,000 sq. ft.], gives a vivid picture of the

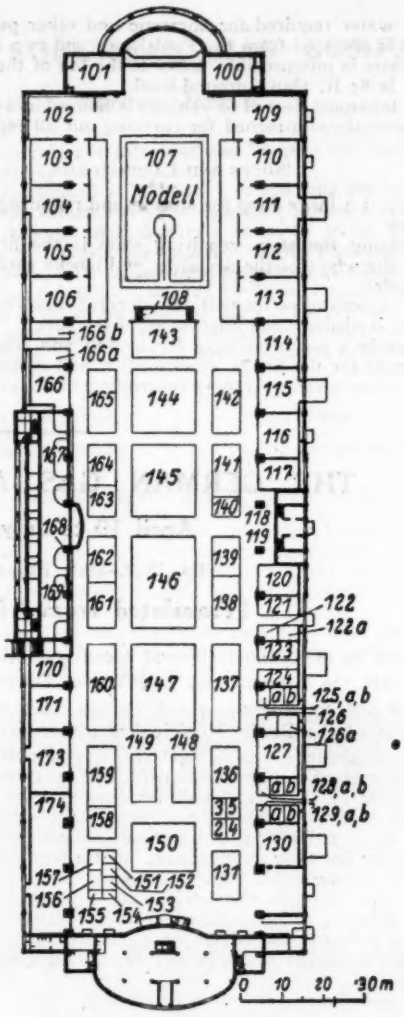
Domestic and Industrial Uses of Gas.

A tour of the upper floor leads first through the exhibits of the industrial organizations of the German gas industry. Here is shown everything that can be done with a cubic metre of gas. A giant frieze in oils shows how gas, with its thousand uses, accompanies and leads us from the day of our birth, and simple representations of industrial processes illustrate that side of the industry. A comprehensive display of instructional material, tables and statistics, and lantern slides shows with what care the personnel of the industry is instructed in these days. Next comes a bright show of posters, leaflets, brochures, and other propaganda material, and, when the visitor has thus obtained a comprehensive survey of the nature and the objects of gas consumption, he is taken on to practical demonstrations, from the cooker to the giant furnace, from the cigar lighter to the industrial oven.

First of all, in several stands, modern cooking installations are shown. Of general interest is a demonstration of the physics and chemistry of cookery.

A Kitchen in Continuous Operation.

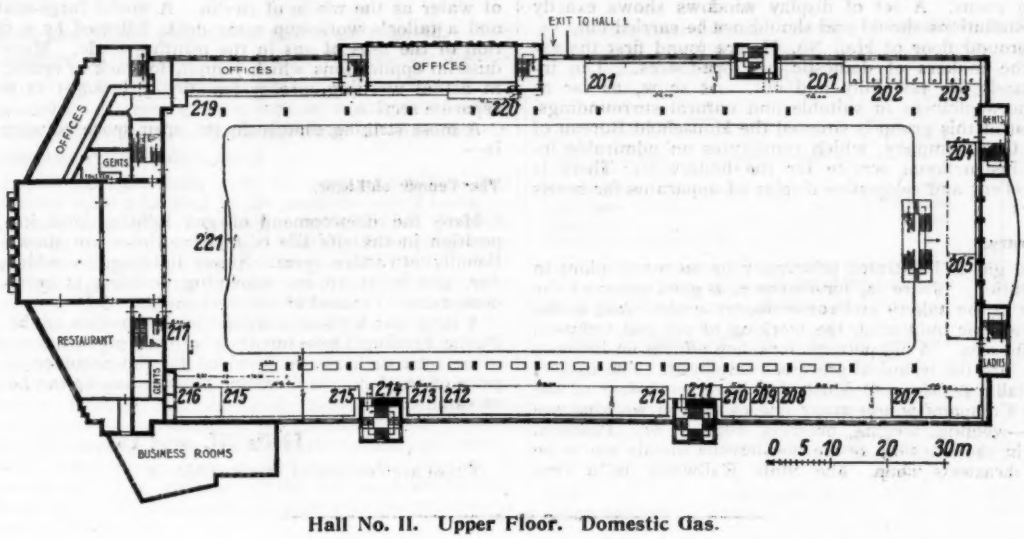
This is surrounded by displays of gas laundry work, baths, &c. Rooms are shown fitted with all modern applications of



Hall No. I.

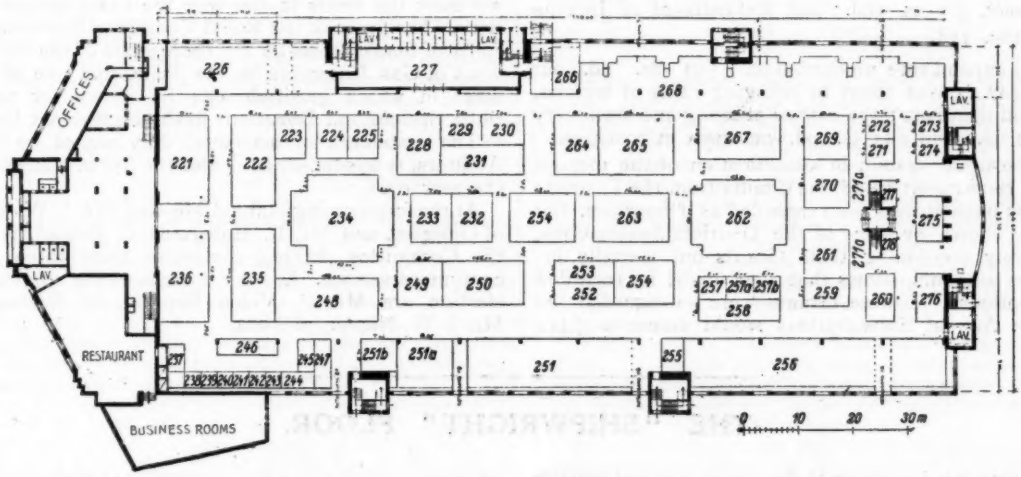
Gas-Works. Distribution. Distance Supply.

100 Standardization
101 Office of Weights and Measures
102 Vienna
103 Hamburg, Lübeck, Bremen
104 Bavaria
105 South-West German Gas Company
106 Various cities
107 Model Gas-Works
108 Genealogy of Gas Production
109 Berlin Gas Company
110–113 Gas Science
114 H. Koppers
115 Literature
116 Foul gas
117 Phenol
118 Union of W. German Wagon Workers
119 Lutz und Gimple
120 Hartmann und Braun
121 Eckardt Cannstadt
122 Dr. Martin Böhme
122a Arga-Regler Hydro
123, 124 Gas Meter Syndicate
125 Wegner & Co.
125a Steel Casting Works, Wittmann
125b Wilh. Goern u. Co.
126 Asmus u. Lorenz
126a Eckardt Cannstadt
127 Kromschröder
128 Braun u. Co
128a Paul Elsner
128b Schirmer, Richter u. Co.
129 Strelow, A G.
129a Record Volz Dietrich
129b Hermann Lembke
130 Elster u. Co
131 Dtsch. Gasgeräte-Ges. Progas
132 Märk. Eisengie B. Friedeberg
133 Vergasungs-Ind. Wien
134 Dinse Maschinenbau
135 Verein Dt. Alumin.-Werke
136 Laboratory
137 Ruttgerswerke
138 Askania-Bambergwerk
139 Allgem. Vergasungsges
140 Martini u. Hünecke
141 Franke-Werke
142 Stettin. Chamotte-Fabrik
143 Aug. Klönne
144 Stettin. Chamotte-Fabrik
145 J. Pintsch, A. G. Pintsch u. Dr. Otto G.m.b H.
146 Bamag-Meguin A.-G.
147 Gas-Works Sales Association
148 Meier und Weichelt
149 Metal Protection
150 Tubes Syndicate
151 Kreberg
152 R. Wadephul
153 Isphording
154 Michel Leck
155 Chemical Products
156 Industrial Standardization Commission
157 Aciditas
158 Lechler, Stuttgart
159 Corrosion
160 Ruttgerswerke
161 Junkers u. Co.
162 Siemens Schuckert
163 Lurgi
164 M. Hempel
165 Stettin. Chamotte-Fabrik
166 Gas Industry Guild
166a, 166b Social
167 R Oldenbourg, Munich
168 Girardet
169 Assoc. of Gas and Water Officials
170 Assoc. of State and Municipal Workers
171 Minoux
173 Accountants' Office
174 Distribution and Long-Distance Supply



Hall No. II. Upper Floor. Domestic Gas.

201 The "C.G.A." of Germany
202, 203 Model Kitchens
204 Instructional Kitchen
205 Instructional Literature
207 Gas Service
208 Meurer
209 Conrad u. Grubler
210 Ruud
211 I. S. Schatt
212 Junkers u. Co.
213 Haupt
214 Monitor
215 Eschenbach'sche Werke
216 Bing-Werke
217 Knodt Metal Works
219 German Association of Gas and Water Works
220 Rietschel u. Henneberg
221 German State Railways



Hall No. II. Ground Floor. Industrial Gas.

221 Junker und Ruh
222 Voss Werke
223 Roeder
224 Demmer
225 Krefft
226 Bakery
227 Hoffmann und Retschlag
228 Ferrum
229 Electrolux
230 Harzer Cookers
231 Vaillant
232 Burger Eisenwerke
233 Kuppersbusch
234 Household Service Berlin Mun. Gas-Works
235 Ascania
236 Homann
237 Deha
238 Willi Toelke
239 Menning Boock
240 Moosdorf und Hochhäuser
241 Müller Bonn
242 Fulmina
243 Fechner
244, 245 Semmler und Bleiberg
246 Pharos
247
248 Senking
249 Allgemeine Elektr. Gesellschaft
250 Schulz und Sakur
251 Glass-Blowing
251a Enamel Work
251b Langbein Pfanhauser Werke
252 Sengelaub
253 Müller's Glass Works
254 Non-Ferrous Metals
256 Laundry
257 Griesogen
257a Dujardin
257b Labbin und Co.
258 Printing
259 Rudolf, Otto Meier und Co.
260 Schneider Innung
261 Erich und Grätz
262 Iron Workshops
263 German Apparatus
264 Schmalisch und Below
265 Pottery Workshops
266 Feuer und Co.
267 Schilde
268 Commerce and Industry
269 Selas
270 Goetschke
271 Intensiva
272 Warstein
273 Liebig
274 Dr. Oppenheim
275 Steatit
276 Küchenwunder
277 Danubia
278 Schrapel
271a German State Railways

gas for heating, cooking, and hot-water supply. Sectional models illustrate its appropriateness for the fixing of roasting and baking ovens. A set of display windows shows exactly how gas installations should and should not be carried out.

On the ground floor of Hall No. II. are found first the exhibits of the makers of domestic gas appliances. The individual stands are tastefully laid out, and show, as far as possible, the appliances in suitable and natural surroundings. In the midst of this group is situated the Household Bureau of the Berlin Gas Company, which constitutes an admirable inquiry and instructional service for the housewife. There is also an excellent and suggestive display of apparatus for hotels and caterers.

Gas in Industry.

Industrial gas is illustrated principally by means of plant in actual operation. There is, for instance, a good show of the uses of gas in the bakery and confectionery trade. And in the glass and ceramic industries, the working of art and technical glass is to be seen. A big pottery workshop affords an interesting insight into the technical processes employed. The uses of gas in metallurgy are well illustrated by a workshop of the Berlin Gas Company where many phases of iron working are to be seen—welding, forging, pressing, cutting, &c. Practical operations in the working of the non-ferrous metals are to be seen in a brazier's shop. The State Railways, in a very cleverly designed exhibit, make known that they consume in all as much gas as the city of Essen, and use the same quantity of water as the whole of Berlin. A model large-scale laundry and a tailor's workshop come next, followed by a demonstration of the uses of gas in the printing trade. Many other industrial applications which cannot, for lack of space, be shown in actual working, are systematically brought to notice in a separate section.

A most striking feature in the open space between the halls is—

The Temple of Light.

Here the development of gas lighting and its important position in the city life of modern times are shown in exceptionally attractive form. Street lighting, in which, even today, gas holds an overwhelming position, is most strikingly demonstrated in and about the temple.

A large gas kitchen is shown in the pavilion of the Municipal Public Feeding Department, where the preparation of meals is to be seen such as are provided for the populace at a current price of 30 pfennig a litre, and where samples can be purchased at small cost.

Halls III. and IV.

These are devoted to water subjects.

BENEVOLENT FUND OF THE INSTITUTION.

Report of the Management Committee, 1928-29.

The Committee of Management have pleasure in reporting with reference to the accounts for the year ended December 31, 1928, that a total sum of £766 7s. 7d. was received. This was derived in the following ways: Annual Subscriptions, £327 11s. 6d.; Donations, £239 14s. 6d.; Interest on Investments, £166 19s. 10d.; Interest on Bank Deposit, £6 2s. 10d.; and Refundment of Income Tax, £25 18s. 11d.

The total expenditure amounted to £538 8s. 4d., out of which £427 2s. was spent in relieving cases of widows, orphans, and members; the cost of printing and stationery was £30 os. 6d.; and £11 5s. 10d. was spent in postages.

Under the usual system of classification of the moneys sent to the Benevolent Fund, the Grants from the Districts Associations have always been regarded as Donations, but the attitude shown by some of the Districts Associations, of not merely continuing their Grants but actually increasing the amounts, shows that they might be regarded as Subscriptions. If these Grants were so regarded the total of the Annual Subscriptions would come to £441 11s. 6d., or £96 16s. 10d. less than the Annual Expenditure. The invested funds provide an income in excess of this, but it should not be taken for granted that the Benevolent Fund is in no need of funds, whether in the form of Annual Subscriptions or Donations. There may at any time be a great demand on the resources and the Committee might then be in the position that they could not meet the needs in the way the cases should be dealt with. The grant of the Royal Charter will be received in a spirit of thankfulness for the recognition of the value of the work of Gas Engineers to the State, and one of the best ways in which gratitude can be shown for this is by Subscriptions and Donations to the Benevolent Fund.

The statement of accounts, duly signed by the Hon. Auditors, is appended, as is also the list of contributors for the year 1928.

At the forthcoming Annual Meeting Mr. J. W. McLusky, of Glasgow, and Mr. R. Robertson, of Bristol, retire from the Committee, having completed their three years of continuous service. As their successors the nominations for election are Mr. C. Valon Bennett, of Rochester, and Mr. J. W. Napier, of Alloa.

THE "SHIPWRIGHT" FLOOR.

The following is a description of the type of steel and concrete floor constructed by the Shipwright Flooring and Engineering Company, Ltd., of 53, Victoria Street, S.W. 1:

CONSTRUCTION.

It is in principle a floor of the filler tile type, but one in which the joists are completely embedded in concrete. This process of construction, which, it is claimed, adds fully 30 p.ct. to the strength of the steel, also affords it adequate protection against fire and corrosion. The cross steels ensure that there are no intermediate weak spots between the main beams, and that the whole construction is strongly tied together. The continuity rods used in contiguous spans ensure added strength, and a further tie in the direction of the main bearing. By this arrangement of construction, the firm embody all the best features of self-centering steel joist floors, on the point of facility and convenience, coupled with the structural advantages obtained by embedding steel in the concrete. No coal residues of any description are used in the construction of "Shipwright" floors.

INSULATION.

The floor also appears to have unique qualities in insulation, which has to be considered under two headings—sound and heat; adequate insulation against both of which is essential in a really good floor.

Confined still air has been proved to be an excellent medium of insulation; and where the floor, as designed, provides ample air space coupled with fillers constructed of diatomaceous earth, it necessarily has many advantages from this point of view. As much actual hollow space as possible seems to have been obtained in the floor in question, and the filling tile is a complete unbroken under-surface of cellular "Fosalsil" (Moler), which has been proved to be the most efficient insulating burnt clay material known.

The lightness of this material naturally aids the advantages secured in the design of the floor. Moler is the lightest form of clay ware suitable for this purpose, weighing about 57 lbs. per c.ft.

It will be appreciated that the saving in dead weight of the floor effects a very substantial economy both in its own construction and other structural parts of the building.

The firm claim that they can lay their floor complete, and leave it ready for use, in considerably less time than it takes to put up any centering forms—or fit the more or less elaborately keyed tiles of most non-centre floor.

FINISHING.

The firm have arranged for tiles to be supplied with soffites slightly roughened, so that a finishing or setting coat of plaster can be applied for very fine finished work, or, alternatively, if required, they will tile with flat under-surface and finish the soffites by pointing and distempering. The tile surfaces provide an uncommon means of fixing, as they can be cut, plugged, and screwed as easily as wood.

"FIELD'S ANALYSIS, 1928."

A copy of the above publication has been received. The Analysis appears in its usual form bound between the distinctive red covers—a feature which renders it conspicuous on the desk or bookshelf of every gas engineer or manager who considers it—as indeed it is—a standard book for reference in matters concerning gas undertakings.

The Analysis for 1928 deals with the same 34 undertakings whose accounts were tabulated in the previous year's issue.

Turning over the pages of the work, it is natural, perhaps, to see first of all how the various undertakings have progressed in a general way during the year. The gas sold by the whole of the undertakings shows an increase over 1927, and amounts to no less than 796 million therms; increases in sales being recorded in the Metropolitan group to the extent of 0·58 p.ct., in the Suburban group 2·47 p.ct., in the Provincial group 0·72 p.ct., and the Dublin Company 2·60 p.ct. Looking further into the statistics, one seeks to find whence the increase has come, whether from an addition to the number of consumers or from an augmented consumption per consumer; and it would appear that the increase is due mainly to the former, for practically all the undertakings show an increase in the number of consumers served. The increases of the various undertakings in this direction for the year ended in 1928 over the year ended in 1927 are as follows:

Increase in Number of Consumers

	P.Ct.
Metropolitan	2·27
Suburban	3·83
Provincial	6·71
Dublin	8·86
Provincial Corporations	3·04
Edinburgh	1·93
Glasgow	1·22
Belfast	0·90

the total number of supplies served in the area covered by the several undertakings in 1928 being 4,568,000, as against 4,425,000 in 1927—an increase of 3·24 p.ct.

This increase in the number of consumers is due, so far as the Metropolitan group is concerned, to ordinary and prepayment supplies in almost equal proportion. Ordinary consumers have increased by 2·36 p.ct. and prepayment consumers by 2·22 p.ct. In the Suburban group, ordinary consumers show an increase of 5·89 p.ct. and prepayment consumers of 1·86 p.ct.; and in the case of Provincial Corporations, ordinary consumers have increased by 1·03 p.ct. and prepayment consumers by 5·51 p.ct. In the area covered by the Provincial Companies, ordinary consumers have increased by 3·98 p.ct. and prepayment by 10·11 p.ct., these latter figures being slightly affected by amalgamations during the year.

It is gratifying to find on a further survey of the information given in the Analysis that the number of public lamps in lighting shows an increase—and this despite keen electrical competition. The 34 undertakings now light no fewer than 351,151 lamps, as against 344,409 in 1927. Of this number, the areas supplied by local authorities, it is noticed, possess as many as 190,747 gas-lit public lamps; the number being proportionately greater than in the districts supplied by company undertakings. The reason for this is, of course, apparent.

Turning now to technical results, it is found that during the year ended in 1928 the several undertakings carbonized 10,076,280 tons of coal, as against 9,907,207 tons in 1927; the increase being due mainly to the greater use of the coal gas plants—due, no doubt, to the cost of oil not falling to the same extent as coal; for it is observed that, while 19 p.ct. of carburetted water gas was made in 1927, only 16 p.ct. was made in 1928.

Comparing the working results of the year 1928 with those of 1927, it is seen that in all groups the cost of supplying gas to the consumer fell; and the figures are shown in the following table:

—	Cost per Therm Sold.	
	Year 1928.	Year 1927.
	d.	d.
Metropolitan	8·266	9·527
Suburban	8·882	10·087
Provincial	7·203	7·775
Provincial Corporations	8·547	8·878

A further dissection of these figures reveals how the reductions have been accomplished; and these are set out as follows:

Items Building-Up Cost of Gas to Consumer per Therm Sold.

—	Metropolitan.		Suburban.		Provincial.		Provincial Corporations.	
	1928.	1927.	1928.	1927.	1928.	1927.	1928.	1927.
	d.	d.	d.	d.	d.	d.	d.	d.
Coal	3·333	4·764	4·420	5·553	3·508	4·202	3·677	6·123
Less residuals	2·156	2·516	2·235	2·725	1·930	2·382	2·274	2·994
Net coal	1·177	2·248	2·185	2·828	1·578	1·820	1·403	3·129
Manufactory expenses	2·766	2·772	2·607	2·850	1·999	2·194	1·892	1·892
Distributing expenses (*less* sundry rentals)	1·098	1·294	0·775	0·934	0·820	0·809	1·345	1·238
Other working expenses	1·439	1·483	1·458	1·449	1·248	1·210	1·263	1·256
Net coal and working expenses (*less* sundry rentals)	6·480	7·797	7·025	8·061	5·645	6·033	5·903	7·515
Special items	0·035	..	0·104	0·087	0·060	0·075	1·468	0·701
Charge for capital	1·731	1·679	1·680	1·620	1·422	1·432	0·742	0·734
Surplus or *deficit*	0·020	0·051	0·073	0·319	0·076	0·235	0·434	*0·072*
Net cost to consumer	8·266	9·527	8·882	10·087	7·203	7·775	8·547	8·878
Reduction in price during year ended in 1928	1·261	..	1·205	..	0·572	..	0·331	..

To the Sheffield undertaking credit must be given for the lowest price charged for gas during the year; the net rental showing 5·392d. per therm. Bath and Widnes follow very closely with rentals of 5·719d. and 5·865d. respectively.

It is pleasing to record that the Analysis supports the opinion now universally held that the industry is in a very healthy condition. In spite of the mild weather experienced in the year 1928, the industry was able to record increased sales of gas; and this finds its reflex in the data given on pages 1 and 2, from which it is seen that the capital expenditure has increased in the case of the Suburban undertakings by 6 p.ct., the Provincial undertakings by a similar amount, and the Provincial Corporations by 4 p.ct.

It is, of course, possible to continue a review such as this to almost any length from the mass of information which is set out in the Analysis; but space will not permit, and it must be left to the interested to make their own investigations according to their views and inclinations.

In conclusion, we can once again recommend to our many readers the acquisition for their technical libraries of this well-known work. The task of producing it is in the hands of Mr. H. E. Ibbs, the Chief Accountant of the Gas Light and Coke Company, who is supported by an excellent and capable staff of assistants. The price of the Analysis is £2 2s., and the volume may be obtained from the Publishers: Messrs. Eden, Fisher & Co., 6, 7, and 8, Clement's Lane, E.C. 4.

Institution of Heating and Ventilating Engineers.—The Summer Meeting of the Institution of Heating and Ventilating Engineers will be held at Bath on June 17 to 19 at the Spa Hotel. The Council Meeting will be held on June 17, while on the following morning there will be a special meeting, when Dr. Margaret Fishenden and Mr. A. F. Dufton will read a paper on "Heating Research at Watford, 1928-29."

Cleansing Sewers of Sulphate Effluent.—For some years, effluent from the sulphate of ammonia plant at the Brierfield Works of the Nelson Corporation Gas Department has been responsible for a great deal of trouble due to the formation of a deposit in the main sewer. This trouble eventually became so acute that the Gas Committee, acting on the advice of the Gas Engineer (Mr. J. Mitchell), decided to entrust the cleansing of the sewer to Messrs. Incrustations, Ltd., of London, who, by means of their chemical treatment, have achieved very satisfactory results.

German Synthetic Petrol Industry.—Germany's first plant for hydrogenating black coal to synthesize petrol will start operations next month, according to a report of the United States Commissioner at Berlin. The Leunawerke, of the German dye trust, is already producing around 50,000 tons of synthetic petrol annually from lignite, or brown coal. The black coal hydrogenation unit is located at Duisburg-Meiderich, and the operating Company is the A. G. fuer Kohlenverfluessigung und Kohleveredlung (Company for Coal Liquefaction and Coal Refining). This Company was founded in 1927, and construction has been in progress on operating units ever since. Storage tanks of 5000 and 10,000 cub.m. capacity have already been erected. The plant will work the Bergius patents, having acquired these for black coal, along with the former Bergius experimental plant at Mannheim-Rheinau. Its recoveries of oil from coal by hydrogenation is given as 45 to 55 p.ct., as against 1½ p.ct. from coal yielding 3 p.ct. of tar.

SERVICE TO THE CONSUMER: PRESTON.

The following notes are supplementary to our report of the Manchester District Conference of the British Commercial Gas Association held at Southport on May 10—see "JOURNAL" for May 15, p. 407, and May 29, p. 528.

PUBLICITY CAMPAIGN, JULY TO DECEMBER, 1928.

Prior to instituting the census and canvass scheme, an amount of preparatory work was carried out. The broadest possible interpretation was placed upon "Service." The responsibility of the consumer and the Company was carefully analyzed. The local conditions and individual characteristics of the population were given special consideration. Co-ordination was introduced within the various departments of the Company—talks to outdoor staff (inspectors, collectors, and fitters) who are in direct touch with the consumers. Advertising was developed by means of picture blocks of modern apparatus. Special window displays were staged in the showrooms. Cookery lectures and demonstrations were arranged. Halls were booked for a week in four different areas for lectures and displays of appliances. A special staff was on duty; and short speeches were made at each demonstration. Leaflets dealing with cookers, fires, gas lighting, and hot water were distributed.

During the educating and preparatory operations the following sales were made:

Cookers from August to December	772
Wash-boilers from August to December	594
Fires from October to December	471
Lighting—	
Burners from November to December	2542
Fittings, pendants, and brackets from November to December	526

CENSUS AND CANVASS SCHEME.

Objects.

(*a*) To obtain an up-to-date and correct record of consumers in the Company's district.
(*b*) To obtain an accurate detail of the supplies of gas to the respective properties.
(*c*) To obtain a record of all appliances installed on the premises of every gas consumer, and to ascertain the working condition of the apparatus.
(*d*) To collect such information as may be essential for instituting "sales campaigns."
(*e*) To classify all premises in the area of supply.

Area of Supply.

To facilitate the working of the Scheme, the Company's area of supply is divided into three Districts.

Method of Procedure.

(*a*) An introduction letter will be addressed to the known consumer stating briefly "The Company's inspector will call."

NOTE.—The letter will be forwarded from the Head Office, and census report sheets prepared for the district inspectors and sent to the works daily.

(*b*) The district inspector must visit each premises within three to four days after the posting of the introduction letter.
(*c*) The inspector will quickly, tactfully, and carefully make a comprehensive survey of the supply pipes and appliances, and make the necessary entries on the census form.
(*d*) The inspector should proffer advice and offer fuller consultation by appointment; make necessary arrangements to carry out any required adjustments to any apparatus; and make it very clear whether the consumer will be required to pay any charges.
(*e*) Introduce the advisability of the further use of gas appliances not at present installed and make recommendations; leave leaflets appertaining to the apparatus; make the necessary entries of such matters on the census report sheet.
(*f*) Emphasize the use of gas for lighting in the home, office, factory, &c. Modern burners ensure efficiency, economy, and perfect lighting.
(*g*) Upon return to the works put through a job voucher with detail instructions. Particularly note if a fully skilled gasfitter is required, or if an unskilled service man is suitable to carry out the work.
(*h*) Complete the census sheet and pass to the record clerk at the Head Office each day.

Works Section.

Special attention is directed to the following:

(*a*) All job vouchers relating to census calls must be given prompt attention.
(*b*) Job vouchers must be completed daily and returned to the Head Office separately to any other vouchers and properly marked.
(*c*) It is important that each item of labour and material is accurately checked.
(*d*) The Chief District Inspector must ensure that all job vouchers are returned by the fitters daily, and that the fitters' reports of work done are carefully examined.

Record Office.

(*a*) Upon return of the census record sheet, the record clerk will forthwith transfer the entries to the census card, for permanent record.
(*b*) Special note will be made of any entry relating to new business, and follow-up letters will be prepared, and instructions issued for despatch and future calls.
(*c*) Coloured tabs to be attached to the census card in connection with business relating to new apparatus.
(*d*) The census record card when fully completed must not leave the record office. It is always available for reference, but must not be taken from the office.

Allocation of Duties.

(*a*) The whole of the outdoor staff and fitting shop will be under the control of the Superintendent.
(*b*) Each district will be in charge of a Chief Inspector who will carry out the census and supervise the whole of the fitting work on the district, including special calls and estimates.
(*c*) Two service men will be attached to each district.
(*d*) The skilled fitters will be equally apportioned to each district, subject to transfer to either district as the exigencies of the work in hand may require.

General.

The census scheme will play a very important part in the future of the Company, and the District Inspector must at all times have in mind the progressive development of his district. Special recommendations and informative reports should be submitted from time to time.

Service Men.

These men are unskilled labour, but each has had a special course of instruction in the adjustment and regulation of different types of apparatus. The special course was carried out at the works of one of the largest manufacturers of gas apparatus, and under specialist tuition.

Service Work.

(*a*) No charge is made for the minor cleaning and adjustment of apparatus noted during the census.
(*b*) A charge is made for materials only in cases of more detailed adjustment or renewal of defective parts. Labour free.
(*c*) Complete cleaning, overhauling, and supply of new apparatus of all descriptions is charged for.

RESULTS.

The scheme was launched in the first week in January, 1929. The men engaged on census are fully qualified and skilled plumbers and gasfitters, and are placed in districts where they are known personally as a result of their service with the Company.

To date (April 30) 2856 census calls have been made.

Cost of Scheme.

Cost of census	9·4d. per call
Average cost of service work	2s. 1·8d. per visit
Average cost of part chargeable work	1s. 6·4d. per visit

Cost to the Company.

The net profit from sales directly made upon the census and service call, deducted from the total cost involved in census, service, and other part chargeable work, reduced the total cost to the Company of the scheme so far carried out to the average of 1s. 3·5d. per visit.

Since the commencement of the census and canvass scheme, sales of all types of apparatus have continued to progress each month. The following comparative figures are quoted for information:

—	Cookers.	Boilers.	Fires.	Hot Water Apparatus.	Radiators.
1928—					
January	74	37	33	..	4
February	93	41	14	2	15
March	98	51	12	..	3
April	132	55	9	..	..
	397	184	68	2	22
1929—					
January	94	65	77	3	21
February	118	57	75	3	9
March	151	68	32	..	1
April	160	87	21	3	1
	523	277	205	9	32

NOTES ON NEW BOOKS.

TRANSACTIONS OF THE WORLD POWER FUEL CONFERENCE, 1928.*

The World Power Fuel Conference held in London last year (Sept. 24 to Oct. 6) was the most important and the finest co-operative endeavour to grasp the present position of the world's fuel supply, and to consider how this supply can best be conserved and utilized, yet made. It was the second of the great sectional meetings which have followed the first plenary World Power Conference held at Wembley in 1924, when the power resources of the world, their utilization and development, were discussed. It was attended by delegates from no fewer than forty-eight countries; and the work entailed in the arrangement of the Conference was immense. That it was so satisfactorily accomplished reflects the greatest credit on all concerned—we may particularly mention Dr. E. W. Smith and Mr. E. J. Fottrell, the Joint Technical Secretaries, and Lieut.-Col. S. S. Ogilvie, D.S.O., and Mr. M. W. Burt, the Joint General Secretaries.

We now have before us the volumes of Transactions published by Percy Lund, Humphries, & Co., Ltd. They include 156 papers, illustrated with maps, diagrams, &c., together with full accounts of the discussions, and sectional summaries and general conclusions; and they constitute a magnificent publishing effort which merits world-wide congratulation and gratitude. The papers are collated into three volumes, and there is an index volume. The latter has been most carefully compiled, and will enable the fortunate possessor quicky to satisfy himself on practically any current problem in fuel supply and utilization. Some idea of the extent of the work will be gained if we mention that the three volumes contain 3856 pages, and the index volume has approximately 300 pages.

Probably the greatest factor in the promotion of fuel economy is the dissemination of knowledge concerning the various fuels available, the steps which are taken in the preparation of such fuels for the market, and the best methods for the utilization of these fuels. Many developments have taken place abroad of which the average British industrialist is unaware, and the facilities for keeping in touch with all the mass of research which is being carried out, and with all the developments in plant which have arisen both in Europe and America, are comparatively small. The steps which have been taken, therefore, to co-ordinate such information are particularly welcome; and it is the duty of the conscientious manufacturer to make himself *au fait* with recent progress as far as possible.

The Fuel Conference concentrated on the problems arising from the winning, preparation and utilization of solid, liquid, and gaseous fuels; and in the papers presented to the Conference the advice, opinions, and recommendations of many British and foreign experts were made available in a concise, authoritative, and readable form. The proceedings of the Conference may thus be regarded as a summary of the state of our knowledge of fuel problems as they exist to-day, with suggestions as to the solutions of the various problems; and as such they are invaluable to any colliery owner, power station engineer, gas engineer, coke oven manager, or other official whose duty it is to ensure that the best possible use is being made of the fuel available, that the most suitable fuel is being purchased for the requirements of his particular process, or that he is getting the most out of the fuel which he is producing.

The scope of the papers presented to the Conference is so wide that nobody can truthfully say, "There is nothing of interest to myself in all this information." A few papers chosen from the various sections, dealing with the coal industry from the standpoint of economic and general considerations, are: "The Constitution of Coal," "The Classification of Coal," "The Cleaning of Coal by Froth Flotation," "The Principles of Pneumatic Separation, with a description of the Static Dry Washer," "Sampling and Testing of Coal," "Determination of Volatile Matter by Low-Temperature Methods," and "The Dewatering and Drying of Coal."

These papers originated from nine countries; the authors setting out the various problems which have arisen in the various countries, and calling attention to the steps which have been taken to solve the problems in the most satisfactory manner. Several authors drew attention to the need for a universal system of coal classification which would embrace all coals, and one which would satisfy the requirements of scientific investigators, technical users, and the commercial world.

INTERNATIONAL STANDARDIZATION NECESSARY.

Prof. Ramzin points out especially what loss of time is incurred in the interpretation of present results of coal analysis owing to the chaotic state of our standards in the various countries. He states: "I would like to express a wish regarding a certain unification, both as regards methods of laboratory fuel investigation and also commonly employed terminology and symbols. When co-ordinating large numbers of analyses, one constantly has to waste a tremendous amount of time deciphering individual analyses for the purpose of ascertaining whether the given values refer to moist or dry coal, whether gross or net calorific value is understood. . . . The ever-developing co-operation of nations in the solution and elaboration of scientific problems . . . calls for an international unification of laboratory methods . . . as well as for a common language in the terminology and symbols pertaining to fuel investigation." He suggests that the World Power Conference should take the initiative in this problem, the solution of which would greatly facilitate the exchange of scientific and industrial experience. In one paper, proposals are made for the technical designation of coal characteristics, and there is included a record of the work done in Austria on the preparation of reference tables, with the suggestion that the Conference should endeavour to come to an international agreement on the matter. Standard specifications for analysis and sampling have been issued in the Netherlands, and are described in another paper.

AMERICAN PROGRESS IN CLASSIFICATION.

The scientific, technical, and commercial aspects of coal classification are receiving attention in the investigations which have been undertaken by the American Engineering Standards Committee, which, in conjunction with the American Society for Testing Materials, has appointed three Technical Committees to review the whole question. One Committee is concerned with scientific classification, whose function is to formulate a system of classification based primarily on chemical and physical properties, and with reference to origin and constitution. A second Committee is detailed to develop a system of classification based on the uses of coal and commercial practice; its work being correlated with that of the Scientific Committee. The third, the Marketing Practice Committee, was formed to collect and collate information on commercial practice for the benefit of the Classification Committees. The Committee dealing with the classification of coal according to use has appointed Sub-Committees to deal with the use of coal in gas making, coke making, the brick and tile industries, the cement industry, the metallurgical industries, smithy coal, coal for railroad service, coal for use in stationary boilers, domestic bituminous coal, and domestic anthracite. Thirteen Sub-Committees were appointed to study the marketing of coal in various areas throughout the United States. The work is now well under way, and the project is of great magnitude and of the highest importance. The Committees have the active support of the coal producers, who now realize that correct classification will provide a better understanding between buyer and seller, and will result in directing each class of coal into the use for which it is most valuable. The Scientific Committee consists chiefly of chemists, geologists, and palæo-botanists, but there is also included a minority of practical fuel engineers to keep the scientific from wandering into the field of impracticability. As stated by Fieldner, it is conceivable that other coal producers abroad may also organize similar committees who may eventually co-operate in agreeing on a uniform system for all countries.

VALUE OF THE TRANSACTIONS.

Enough will have been said in the few comments above to indicate the extremely valuable contributions which have been made towards the elimination of the difficulties arising from our lack of uniformity in the classification of coal; but all this good work goes for nought unless the results already obtained are appreciated and digested by the coal consumer and producer both here and abroad. The Transactions of the Fuel Conference render available the details of the efforts put forth to avoid this confusion in a comparatively cheap form, authoritatively, and without bias. It is thus incumbent upon all those who have the welfare of the coal industry at heart to study these papers at first hand.

TREATMENT OF INFERIOR FUELS.

Considerable interest is at present being taken in the exploitation and utilization of those inferior fuels occurring in our Colonies, such as the lignites of Morwell, of Nigeria, Saskatchewan, and New Zealand; and again much valuable information concerning the classification and up-grading of such fuels is contained in the papers presented to this section of the Conference. The lignitic coals are non-coking and contain high percentages of moisture, which demand that special steps shall be taken in their utilization. The combustion of such coals in Australia is described in one paper, while another gives details of the success which has been attained in their utilization in pulverized form in Korea. The special steps taken in

* "Transactions of the Fuel Conference, World Power Conference, London, 1928." Published by Percy Lund, Humphries, & Co., Ltd.; price £12 net. In three volumes, with separate index volume.

the Dutch East Indies and in Russia to ensure the optimum conditions of combustion are also described, while the low-temperature carbonization of these coals is described by Prof. Kamo. Further trials have been carried out in Bucharest on the distillation of lignites at low temperature, while results obtained in Czecho-Slovakia are also described. To those financially interested in the exploitation of such low-grade coals, this information is of particular interest, and represents the result of work not described elsewhere, and which would have been extremely difficult to obtain had not this Conference been held.

The high-temperature carbonization of lignite, as also the gasification of lignites in Mond, Kerpely, Koller, and other types of gas producer, have been ably dealt with, and will well repay attention by the reader.

Sampling and Testing of Fuels.

It is, of course, evident that results obtained by analysis are contingent for their value upon the accurate sampling of the fuel. An inaccurate sample, not representative of the bulk of the fuel supplied, is utterly useless as a medium for the expression of results upon which large contracts for purchase may be based. In Section "B" of the proceedings, the whole question of sampling and testing is thoroughly investigated. Such questions as the use of gross and net calorific values for the purpose of guarantee tests, the sampling and testing of coal, and a practical comparative basis for the calorific value of coal are considered in detail. Though it may not be possible to specify detailed instructions which could be followed in all circumstances in taking samples representative of a consignment of solid fuel, the procedure and precautions to be observed, as outlined in the paper by the Gesellschaft für Wärmewirtschaft, of Vienna, will doubtless meet with general approval. In fact, the general procedure is already adopted by a large number of fuel technicians. The experience gained on the Continent has led to the conclusion that efficiencies based on the gross calorific value are not satisfactory, and that net values only are required.

Preparation of Coal for the Market.

It has been pointed out by numerous authorities on many occasions that, if Great Britain is to retain her markets for coal, far greater attention will have to be paid to the questions of screening and cleaning. The available information dealing with coal screening and preparation for the market is scattered throughout a vast mass of literature; and Section "C" of the Conference is therefore of particular value, since it deals with the preparation of coal for the market, including screening, cleaning, drying, and briquetting. These subjects are dealt with by seven different authors, from three different countries.

The interest which is being taken in the subject in this country will be realized when it is stated that, of the papers submitted, five were presented by British authors, while one was presented by the United States and one by Austria. The British papers were excellent in their presentation of the subject; that by Mr. R. A. Mott dealing especially with the dewatering and drying of coal. This question is one which presents numerous difficulties, and the author is to be congratulated on his lucid exposition of the fundamental laws affecting the dehydration of coals of varying size. The paper by Dr. Chapman, too, is one which will well repay the attention which every coal owner ought to give to this subject. This latter paper describes the various types of coal cleaning plants at present available, and outlines their particular advantages and disadvantages.

New Information on Dry Cleaning.

Dry-cleaning methods have been adopted on an ever-increasing scale, and two papers were devoted entirely to descriptions of the "dry" methods which have been developed in comparatively recent times. Information which has not appeared elsewhere included a description of the Raw table, or static dry washer.

Froth flotation is another subject about which little is known in this country, at least, as far as coal cleaning is concerned. On the Continent, on the other hand, a large proportion of the fine coal is cleaned by this method; and since there seems little doubt that one of the greatest problems of the British coal industry is the successful utilization of our small coal, the information contained in the paper by Prof. Edser and Mr. Williams will assist in the solution of this problem.

Coke Oven and Gas-Works Practice.

The carbonization industries have been provided with much that is important in the way of technical, economic, and purely scientific information. Such questions as the rate of transfer of heat through coke oven walls, coke quenching and cooling, and coke screening, are of interest to the technical man; while papers concerning the economics of coke manufacture in the coke oven industry, the utilization of coke oven gas by the gas industry, the gas industry as a source of domestic and industrial energy, and points of importance for an economical comparison of the value of the heat unit in gaseous and solid fuels, should be studied by those responsible for the development of public schemes for the utilization of our coal supplies to the best advantage. The paper on the fundamental aspects of combustion is of particular interest to all those who desire to keep in touch with the latest research, and who are constantly on the look-out for new methods of improving the over-all thermal efficiency of the plants of which they may be in charge.

Low-temperature carbonization has a separate section, and is fully considered. The production and use of gas, in its general applications, and also in specialized cases, formed a separate sub-section. This large section is full of interest.

The Transactions should be on the shelves of every public body if only for the sake of having available Section "L," which incorporates a number of papers dealing with the utilization of fuels for domestic purposes. Some considerations concerning the development of gas-burning appliances are outlined in one paper, while another makes a comparative study of solid fuel, gas, electricity, and oil for domestic purposes. American practice is described in the paper on "Domestic Heating by Means of Solid Fuel, Oil, Gas, and Electricity." Manufacturers of domestic appliances would find a considerable amount of useful information in this latter paper, since it discusses the efficiency of house-heating boilers, and domestic heating by means of gas.

Wide Range of Subjects.

Space does not allow any detailed description of the various sections, but it should be mentioned that among other subjects dealt with were internal combustion engines; the transmission of power; waste-heat recovery; peat utilization; economic possibilities in the better co-ordination of fuel utilization; the composition, classification, preparation, storage, and handling of gaseous fuels and of products of the carbonization industry; the composition, classification, preparation, storage, and handling of liquid fuels; and economic and general considerations affecting the oil industry.

Briefly, the Transactions should be found on the shelves of every engineer concerned with the preparation and use of fuel, whether solid, liquid, or gaseous, of every person concerned in the financial exploitation of fuel supplies, of everyone engaged in the development of methods for the better utilization of our fuel supplies, and, generally, in the hands of every person interested in making the most of our own or of foreign supplies of fuel. The information contained in the volume is invaluable, the data collected in such a relatively small compass are most comprehensive, and the trend of modern development has been pointed out in a way which can only act as a stimulus to those entrusted with the work of improving existing apparatus or of inventing new appliances with the object of securing the highest degree of fuel economy, and with it increasing prosperity for industry as a whole.

U.S. Output of Fuel Briquettes in 1928.—The American production of fuel briquettes in 1928 was 947,423 tons; compared with 1927 this showed a decrease of 2·4 p.ct., but in comparison with 1925 an increase of 12·9 p.ct. Despite an abundant supply of both anthracite and bituminous coal throughout 1928, briquette sales declined only 4·8 p.ct. from the high level set during 1926, when demand was greatly stimulated by the anthracite strike. The total quantity of raw fuel used in 1928 was 940,806 tons. Of this, 40 p.ct. was anthracite and semi-anthracite; 52 p.ct. was semi-bituminous and bituminous coal and semi-coke; and 8 p.ct. was sub-bituminous coal (black lignite) and carbon residue from the manufacture of oil gas. Asphaltic pitch was employed as a binder either alone or in combination by 13 out of the 21 plants active in 1928. Two plants briquetting oil-gas carbon required no binder. Six of the 19 plants using a binder reported that they re-carbonized briquettes after coming from the presses in order to drive off smoke from the binder.

Low-Temperature Carbonization in Australia.—The Australian Benzol and Coal Distillation Company has been registered at Sydney, with an authorized capital of £300,000, divided into 600,000 shares of 10s., of which 250,000 have been offered for public subscription, 80,000 are vendors' shares, and the remainder is reserved. The Company proposes to use the Illingworth coal carbonization plant and also benzole refining and tar distillation plants. The site chosen for operations is Lake MacQuarie, near Newcastle, with a frontage of both lake and ocean, in close proximity to a colliery yielding coal suitable for low-temperature carbonization purposes. The Company estimates the production from 300 tons of small coal at 216 tons of "Ricoal" smokeless fuel, 5100 galls. of crude oil, 1356 galls. of benzole, 4000 lbs. of sulphate of ammonia, and 1,500,000 c.ft. of rich gas. A tunnel driven from the foot of the cliff at the oceanside site direct into the coal seam will obviate the necessity of mine shafts, and enable the speedy transfer of coal to the carbonizing plant, which it is proposed to erect on the foreshore at the tunnel's mouth.

SOME ASPECTS OF CORROSION IN CAST-IRON MAIN PIPES.

By J. R. BRADSHAW, B.Sc. Eng. (Lond.), of West Hartlepool.

North of England Gas Managers' Association, May 24, 1929.

It was not until recent years that the subject of corrosion received anything like the investigation and study which it deserves. While latterly the study of this unfortunate property, as relating to wrought iron and steel, has been carefully explored, there is a dearth of material to which we can refer upon the behaviour of cast iron under cold conditions such as obtain where cast iron is buried in the ground; and it is seriously suggested here and now that there is no problem which is of greater importance to gas (and water) engineers at the present time. The behaviour of cast iron after a long life under slightly corrosive influences, both internally and externally, calls for immediate comprehensive research.

The term " corrosion " is not easy to define, but for the purpose of this paper it may be considered to include all cases of deterioration or decay, but excluding oxidation of the metal due to heat alone, and, of course, mechanical abrasion and failure.

THEORIES OF CORROSION.

There have been a number of theories attempting to account for corrosion, but the two commonly accepted ones are the electrolytic theory and the acid theory. Taking the latter first, it is presumed that pure water and pure oxygen are not alone capable of corroding pure iron, but, for corrosion to be set up, an acid must be present. The quantity of acid may be merely the slightest trace, since the first molecule of acid may, according to this theory, be sufficient to set up unlimited corrosion. In its simplest form, and taking carbonic acid as an illustration, the procedure is as follows:

$$2Fe + 2H_2CO_3 = 2FeCO_3 + 2H_2$$
$$4FeCO_3 + O_2 + 10H_2O = 4Fe(OH)_3 + 4H_2CO_3$$

Carbonic acid is thus re-formed; and as long as the supply of oxygen and moisture is kept up, corrosion will continue until the metal is destroyed.

In the electrolytic theory, it is assumed that water has a solvent action on all substances, including even iron; solubility being only a relative term. When a substance such as iron dissolves in water, the solution becomes a conductor of electricity by dissociating into atoms carrying static charges of electricity, such atoms being known as " ions." If now an electric current is passed through the solution by means of electrodes, electrolysis occurs which consists of a mechanical movement of the ions " cations " carrying positive charges moving to the negative electrode, or cathode, and " anions " carrying negative charges moving to the positive electrode, or anode. But if, instead of passing an electric current through the electrolyte, two metals of different natures are placed in the electrolyte and connected by a wire, a current is set up flowing from the more electro-positive metal to the less electro-positive one. Moreover, even if there is no mechanical contact by wire, the same effect is produced through the solution and without metallic electrical contact.

In both these theories, the presence of a hydrogen " ion " is assumed. Each theory has its adherents (and there have been many other theories), but there is no need for our present purpose to argue as to the correctness of either. It can now be accepted that both are correct, and that the initiation and process of corrosion is " electro-chemical."

In practice, the commonest form of corrosion is set up by electrolysis through a difference of structure due possibly to tension or torsion, or some such irregularity or impurities which produce different potentials in adjoining particles or areas of the surfaces, causing a solution of the iron, which is deposited as rust. This action is galvanic, and should be distinguished from electrical action. The latter assumes an external current and produces a uniform action over the surface of the metal, while galvanic action more frequently produces local corrosion or pitting.

There is another very important way in which initiation and progress of corrosion may be produced, and that is the passing of a current from some external source. Here electrolysis is set up; and in the case of iron pipes the iron and the earth act as electrodes, and the moisture is split up into hydrogen and oxygen.

Any time spent in the study of this phenomenon of corrosion by that branch of engineers, such as ourselves, who have so large a proportion of their capital sunk in the ground, must be well worth while. All the conditions for the initiation of corrosion are present in an iron pipe buried in the ground. Moisture, oxygen, carbon dioxide, and sulphur compounds are present in all our supplies to a greater or lesser extent; and in view of recent experiences in main breakages, it behoves us to give the question of corrosion the minutest attention. Unfortunately it is most difficult to reproduce the conditions which obtain in practice. All the factors vary to such a great extent among themselves that it is almost impossible to reproduce them. It is imperative, however, in my opinion that something should be done to give us more adequate information on the behaviour of our unseen underground works. The corrosion goes on unseen; and while pipes are discovered to be in apparently perfect condition, though buried in the ground for very many years, in other cases a pipe becomes weakened in a very short time where the conditions are different.

INVESTIGATION OF CORROSION.

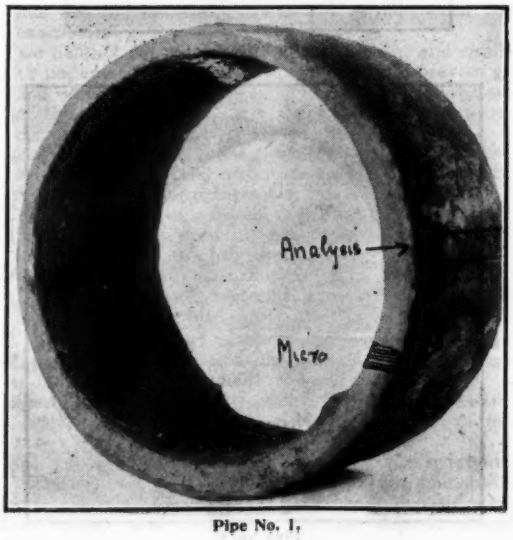
It will probably be of interest to members of the Association to consider the report of an investigation of eight samples of pipes of varying sizes, ages, and conditions of burial—some gas and some water—taken up from various districts in the Hartlepool area.

SAMPLES OF CAST-IRON PIPES.

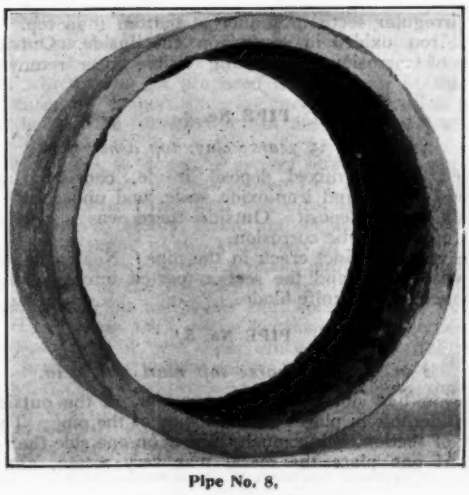
(1) 6-in. water main; 47 years; unscraped; 3 ft. 6 in. clay.
(2) 6-in. gas main; oldest known main, prior to 1850; marly clay 1 ft. 9 in.
(3) 3-in. water main; 40 years; sand and soft marl 1 ft. 9 in.
(4) 3-in. gas main; 35 years; clay, top ashes 4 ft.
(5) 2-in. gas main; 40 years; soft marl 1 ft. 9 in.
(6) 6-in. water main; 14 years; reclaimed sea shore; brine soaked clay, 2 ft. No traffic.
(7) 1½-in. water main; 20 years; in open yard, unused.
(8) 6-in. water main; 47 years; after scraping; 4 ft. 9 in. clay.

It should be noted that samples Nos. 1 and 8 are from the same main before and after scraping.

The general scheme was as follows: Each pipe was carefully examined both inside and outside for characteristics of fracture, deposit, corrosion, pitting, wear, &c.; then a photograph was



Pipe No. 1.



Pipe No. 8.

taken of each pipe, after which each pipe was cut into two halves, one half of each pipe was scraped clean of the deposit, both inside and outside. These deposits were kept separate and analyses made of them. Drillings were taken from the metal after cleaning from deposit, &c., and these were analyzed. Sections were cut from the pipes from portions free from corrosion, and also where corrosion had taken place. These sections were polished, and then examined under the microscope, before etching to show the extent of the corrosion into the metal, and after etching to show the general character of the metal.

Owing to the small length of pipe sent, and also to the irregularities in the sections of the pipe due to action of the corrosion and other things, it was not possible to obtain any compressive, tensile, or other tests of a light nature to give figures which could be relied upon.

PIPE No. 1.

6-in. water main; 47 years; unscraped; 3 ft. 6 in. long.

Inside.—Brown deposit of iron oxide, principally in layers. In a number of places this deposit had a nodular formation. Depth of corrosion appears to be very even from one-eighth to one-sixteenth. Slight pitting of the metal is apparent after scraping away the deposit. The deposit is due to action of the water, carbon dioxide, and oxygen on the metal; and there is probably some deposit from the water mixed with it.

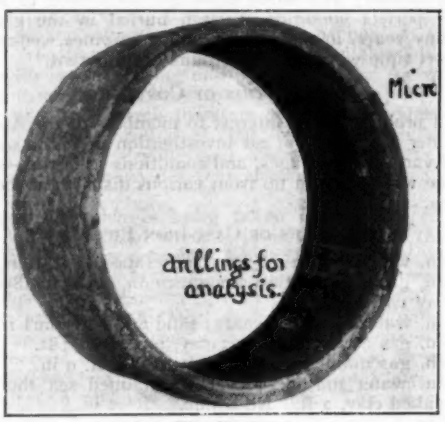
Outside.—Showed pitting of the metal after scraping the deposit away. Also there was evidence of slight local electrolytic corrosion.

For analyses of metal and deposits see Tables.

PIPE No. 2.

6-in. gas main; oldest known main, prior to 1850; *marly clay* 1 *ft.* 9 *in.*

Considerable elctrolytic corrosion on outside (see Diagrams). Inside deposit caused mainly by deposition of products carried over by the gases. This deposit smelt strongly of gas, as did



Pipe No. 2.

the whole pipe, which seemed to be thoroughly impregnated with gas.

Samples polished and examined under the microscope showed very little corrosion on the inside.

PIPE No. 3.

3 in. water; 40 years; sand and soft marl 1 *ft.* 9 *in.*

Very irregular section, thinner at bottom than top. Brown deposit, iron oxide, in layers on the inside. Outside fair amount of corrosion and pitting visible after removing the marl.

PIPE No. 4.

3 in. gas; 35 years; clay, top ashes 4 *ft.*

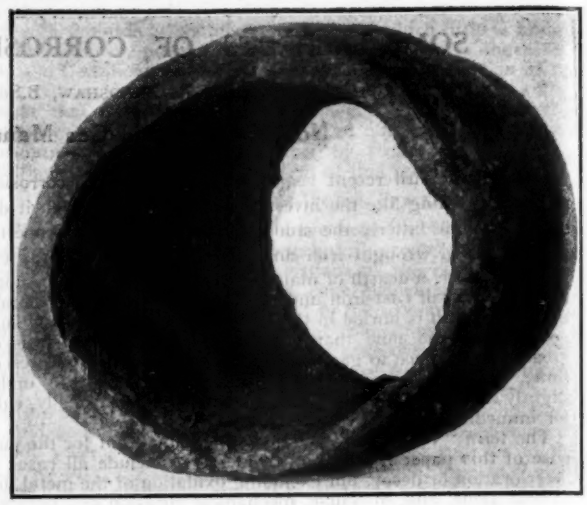
Showed a very mixed deposit inside, consisting of carbonaceous matter and iron-oxide scale, and underneath this a yellowish brown deposit. Outside there was a considerable amount of electrolytic corrosion.

There was a distinct crack in the pipe. Near this point the metal was rotten, and the section parted into two pieces on being poked with a knife blade.

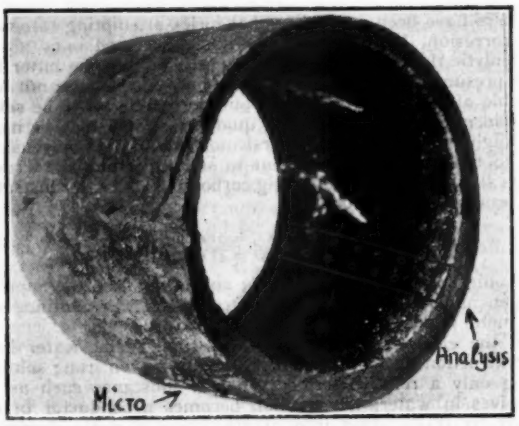
PIPE No. 5.

2 in. gas; 40 years; soft marl 1 *ft.* 9 *in.*

Corrosion had not penetrated very far on the outside, but was considerable in places on the inside of the pipe. This pipe was out of section, being much thinner on one side than on the other. At one place the metal was very rotten, and broke away.

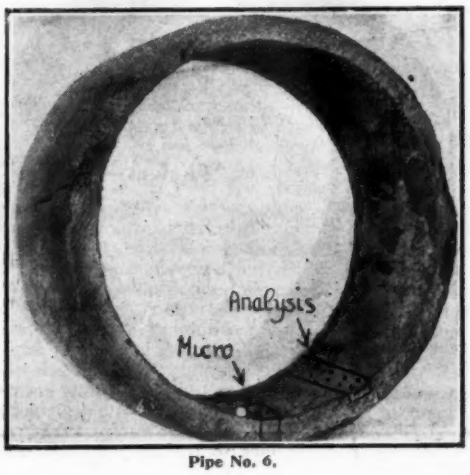


Pipe No. 3.



Pipe No. 4.

Pipe No. 5.



Pipe No. 6.

PIPE No. 6.

6 in. water; 14 years; reclaimed seashore; brine soaked clay 2 ft.; no traffic.

Slight deposit of mud on top of brown oxide. Formation in layers, slightly nodular. Considerable electrolytic corrosion from outside to inside. Crack through pipe at one portion of sample.

PIPE No. 7.

1½ in. water; 20 years; in open yard; unused.

This pipe was slightly pitted inside and outside.

MICROSTRUCTURES.

Microphotographs have been taken, but it is unfortunately impracticable to reproduce them in the space at disposal. (Lantern slides prepared from the microphotographs were here thrown on to the screen, and described.)

Analysis of Metal Unaffected by Corrosion, P.Ct.

Pipe No.	1	2	3	4	5	6	7
Silicon	1·65	2·17	2·02	1·55	1·88	2·17	2·73
Sulphur	0·074	0·106	0·147	0·094	0·132	0·084	0·076
Phosphorus	1·51	0·72	0·95	1·49	0·88	1·39	1·41
Manganese	0·36	0·52	0·58	0·39	0·30	0·31	0·40
Graphite	2·48	2·45	2·45	2·48	2·30	2·54	2·45
Com. carb.	0·96	0·74	0·96	0·82	0·95	0·76	0·88

Analysis of Metal Directly Under where Deposit due to Corrosion had been Scraped Away, P.Ct.

Pipe No.	2	5	6
Silicon	2·26	1·98	2·16
Sulphur	..	..	..
Phosphorus	0·77	0·76	1·48
Manganese	0·61	0·26	0·33
Graphite	2·54	2·30	2·56
Com. carb.	0·79	0·97	0·85

Analyses of Deposits Scraped Away from Inside and Outside of Pipes, P.Ct.

—	No. 1.	No. 2.	No. 3.	No. 4.	No. 4.	No. 5.	No. 6.	No. 7.	Nos. 2, 4, 6.
Silica and insoluble	7·0	3·0	1·8	0·8	2·6	1·8	14·0	4·0	13·8
Ferrous oxide	10·0	2·65	3·57	1·85	6·75	4·9	6·4	18·0	59·9
Ferric oxide	57·2	23·2	70·73	79·15	69·0	69·45	53·23	56·3	8·0
Alumina	1·0	3·0	0·5	2·5	2·6	1·2	4·5	..	..
Lime	0·8	0·4	0·6	trace	trace	1·4	0·6	0·2	trace
Magnesia	0·36	0·07	0·07	trace	trace	0·33	0·07	0·07	0·14
Phosphoric anhydride	0·23	..	0·28	0·15	0·7	..	0·07	2·54	8·54
Loss on ignition	21·9	68·4	21·4	15·5	18·95	19·7	19·3	19·0	2·5
Graphite	..	..	..	..	..	..	..	..	8·4
Metallic iron	..	..	..	..	..	..	..	..	..
Deposit from	Inside	Inside	Inside	Inside Brown deposit from top layer.	Inside General deposit.	Inside	Inside	Inside	Outside

DESCRIPTION OF DEPOSITS.

1 and 8. Brown colour, light to dark, nodular in places, in layers in other places. Essentially hydrated ferric oxide.

2. This deposit was not very thick, and had the appearance of coke and tar deposit. Strong smell of gas (the pipe itself was impregnated with gas). It consisted of various organic compounds which have not been further examined.

3. Two distinct deposits. Top deposit brown, and similar to 1; underneath deposit, and next to metal, greyish green, and similar to 2, 4, 6. This occurred where the section of the pipe was thin, and was evidently due to outside corrosive effects working to the inside.

4. Vesicular deposit showing well developed bubbles and evidence of pitch and carbonaceous matter, together with a large amount of oxide scale.

5. This deposit was of a brown colour.

6. Slight deposit of mud on top of brown oxide deposit; layer formation, slightly nodular.

7. Very slight brown rust deposit.

2, 4, 6. Outside deposit, greenish grey colour with metallic lustre due to graphite.

Taking a survey of the pipes as a whole, the following conclusions have been arrived at:

In pipes Nos. 1, 3, 4, 5, 6, 7, and 8 the deposit is essentially brown hydrated ferric oxide, with various amounts of ferrous oxide.

In No. 3 there were two distinct deposits, one overlying the other. The top deposit was brown and in layers, and similar to the deposit in No. 1 pipe. The underneath deposit was different in colour, and was more like the deposit caused by electrolytic corrosion.

The deposit in No. 2 (gas pipe) showed much carbonaceous and organic matter deposited from the gas in transit.

No. 4 showed a somewhat similar deposit, but not so much carbonaceous matter.

With regard to the outside corrosion, this consisted essentially of ferrous oxide, &c., and is typical of corrosion due to electrolytic soil action.

As far as the chemical analyses of the pipes are concerned, these seem to be normal analyses, except Nos. 1, 4, and 8, which have high phosphorus, and 3 and 5, which have high sulphur. The phosphorus is not out of the way for cast-iron pipes.

In general, the microstructures of the various metals are typical, and confirm the analyses.

Pipes Nos. 1 and 8, from general consideration, appear to be good for some years longer.

No. 2 would have stood up for some further time probably, as the soil corrosion was very hard and firm, and had not penetrated to the inside of the pipe.

No. 3 was out of section and badly pitted in places, but there is a lot of good metal left in it.

No. 4 had done its work.

Chemical analyses of the pipes and also of the deposits are given, as also are sketches showing the sections of the pipes and the extent of the corroded areas.

From the microstructure examination, the corrosion in most cases seems to emanate from graphite nuclei.

Most of the pipes show a number of voids or dirt holes across the section. When polishing several of these samples, it was noticed that a definite polish etching attack started round the graphite areas.

It is not easy to draw any hard and fast conclusions from the above investigation, but it does make it perfectly clear that a comprehensive inquiry would be most desirable and helpful. One thing, however, is certain—that if a standard and unvarying quality of iron could be relied upon of a known and high density and of standard structure, we should be a long way on the road to an almost indefinite life of our buried ironwork. Whether the required density and structure are to be obtained by spinning or some such process, in preference to the ordinary angle or vertical static casting, it is unwise to say here. No objection can, however, be made to the profession of the author's own favourable opinion of the spun pipe from the viewpoint of both the microstructure and practice in various earths.

Valuable contributions to the study of corrosion have been made by Mr. J. G. Tapley at the Institution Meeting in 1921, and by M. Antoine Bolzinger (see "JOURNAL," Vol. 179, p. 499). These were, however, directed towards:

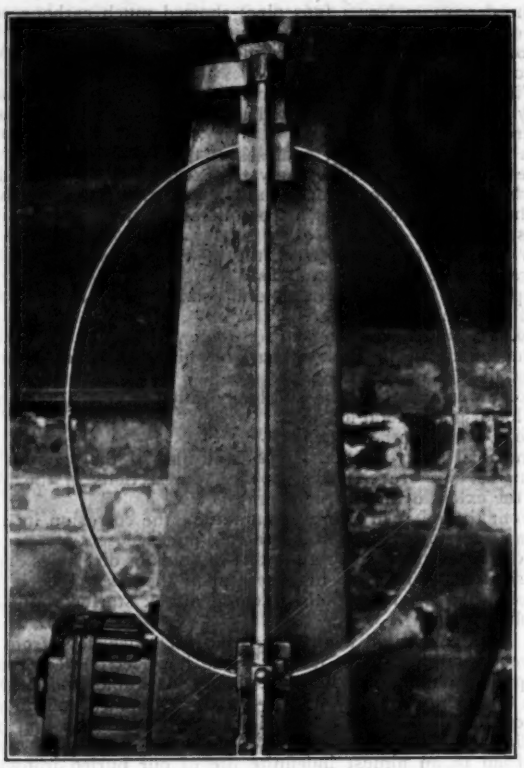
(1) The effect of acid and of alkaline earths upon wrought iron and steel pipe.

(2) Electrolytic corrosion by stray earth currents.

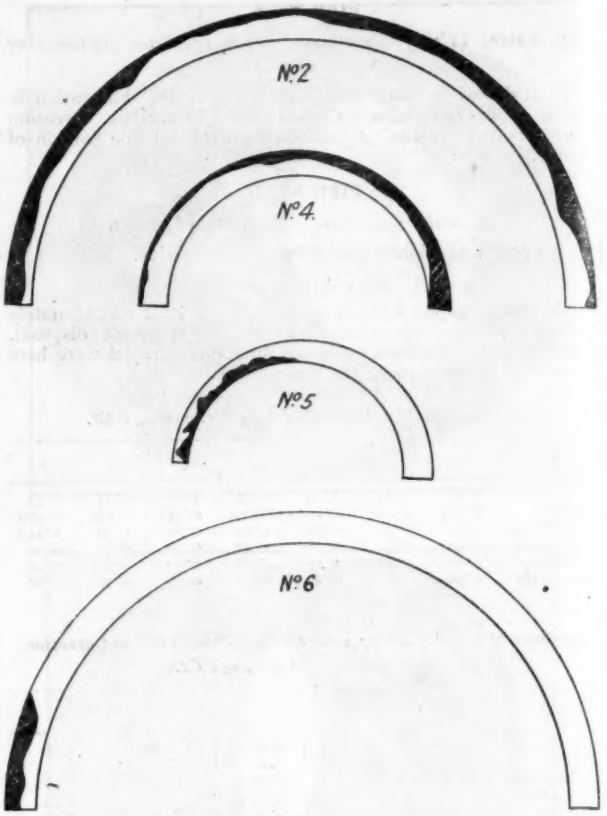
It is obvious that corrosion from stray currents and deterioration due to soils cannot be ignored, but these are very wide subjects which it is not proposed to deal with in this paper. In any case, the proper place for their consideration is after, and not before, the consideration of the ideal metal and structure.

It is impossible to leave the subject without reference to the capacity of cast iron to resist repeated or alternating stresses; and it is here where the least test data are available. Comprehensive tests by Moore, Lyon, and Inglis at the Engineering Experimental Station of the University of Illinois were made, and the results were issued in a report published in June, 1927, entitled "Tests of the Fatigue of Cast Iron." The study of this report by all gas and water engineers would be well worth while. They show that, while brittleness is regarded as an inherent property of cast iron, since this material ruptures without preliminary visible deformation under steady tensile stress, yet it can suffer permanent deformation by some intra-crystalline slip, with consequent favourable readjustment of stress-distribution without starting a fatigue crack. They further show that the endurance ratio

$$\frac{\text{Endurance limit in reversed flexure}}{\text{Ultimate tensile strength}}$$



Loading of a 1-in. Strip of 16-in. Spun Cast-Iron Pipe. Outside layer consisting of portion which had been chilled and then subsequently annealed.



Showing Position and Extent of Corrosion in Some of the Samples.

for cast irons tested averaged 0·35. This value may be compared with the average values of 0·50 for wrought iron and steel, which is probably surprising to most people who have not specially studied the subject.

There is not time here to go further into the intricacies of fatigue, but it is obviously the one side of the subject towards which research should be directed.

Two experiments with the object of illustrating the flexibility of cast-iron main pipes (a property which the unthinking among us imagine does not exist at all) were carried out in the presence of the author.

(1) A standard Class B 4-in. pipe, 12 ft. long, was supported horizontally at 9 ft. centres, and loaded gradually at a point midway between the supports. The deflection was equal to the diameter of the pipe before fracture took place.

(2) The interior of a standard 16-in. spun pipe was bored out, leaving the exterior shell or chilled portion, from which a strip 1 in. wide was cut. The resultant hoop was then suspended and loaded, with the surprising result shown in the accompanying photograph.

These experiments were not directed towards the study of fatigue, but towards flexibility and ductibility, which have an important bearing upon this phenomenon.

The influence of low temperatures on the tensile strength of cast iron cannot be ignored, as the failure of castings in very cold weather has frequently been observed. The author is indebted to Mr. J. G. Pearce, Director and Secretary of the British Cast Iron Research Association for the results of experiments recently carried out in Germany, where it is shown that in five cast-iron mains tested "there was a distinct tendency for the tensile strength to increase at very low temperatures." This is surprising, but the question of thermal contraction and the consequent strains thereby set up should not, of course, be overlooked.

The whole subject is one which bristles with interest yet with difficulties; and it is quite impossible to do more than touch the fringe of the subject in the course of such a paper as this. But deterioration of our underground works is going on slowly but surely. There is the ever-increasing stress and strain to which they are subjected by modern traffic (one hears of the construction of a 14-wheeled road vehicle to take 150 tons load!); there is the question of modern road construction, making for impossibility of access by public utility undertakings, so ably discussed in the "GAS JOURNAL" recently by Mr. R. W. Edwards, of Aldershot (see "JOURNAL," Vol. 184, pp. 183, 250, and 320); and a hundred-and-one other considerations which make it imperative that the desire for further comprehensive investigations be stimulated in those more ably equipped for turning the knowledge acquired to the practical advantage of the industry.

Discussion.

The PRESIDENT said Mr. Bradshaw had gone to a great deal of trouble in preparing his paper, which had been enlivened by lantern slides. One could not help but notice, on those slides, that a 1½ in. water pipe which had been lying in a yard for 20 years showed little deterioration in comparison with pipes that were in the ground. That seemed to show conclusively that the problem of the buried pipe was one of some magnitude, and required a great deal of investigation. It was only two or three years ago, however, that the Institution of Gas Engineers appointed a Committee to investigate the deterioration of wrought and cast iron service pipes. Mr. Blundell and Mr. Tarratt had both served on that Committee, and much valuable work had been done by the members for the industry, and it had saved them a great deal of money. If he might be allowed to suggest it to the representatives on the Council of the Institution, the question was one which would repay further investigation. Cast iron at the beginning was very good; but they were reaching a stage in the industry when pipes were wearing out, and to-day it was going to cost a great deal more money than a few years ago to lay new mains. It was the duty of the gas industry to see that the money was spent to the best advantage.

Mr. F. P. TARRATT (Newcastle), moving a vote of thanks to Mr. Bradshaw, suggested that any Committee that carried on investigations upon the subject would be strengthened if Mr. Bradshaw was co-opted. When they were coming into contact with breakages, the paper Mr. Bradshaw had read would be of great help as a work of reference.

Mr. HERBERT D. LEES, jun. (Hexham), seconded the vote of thanks.

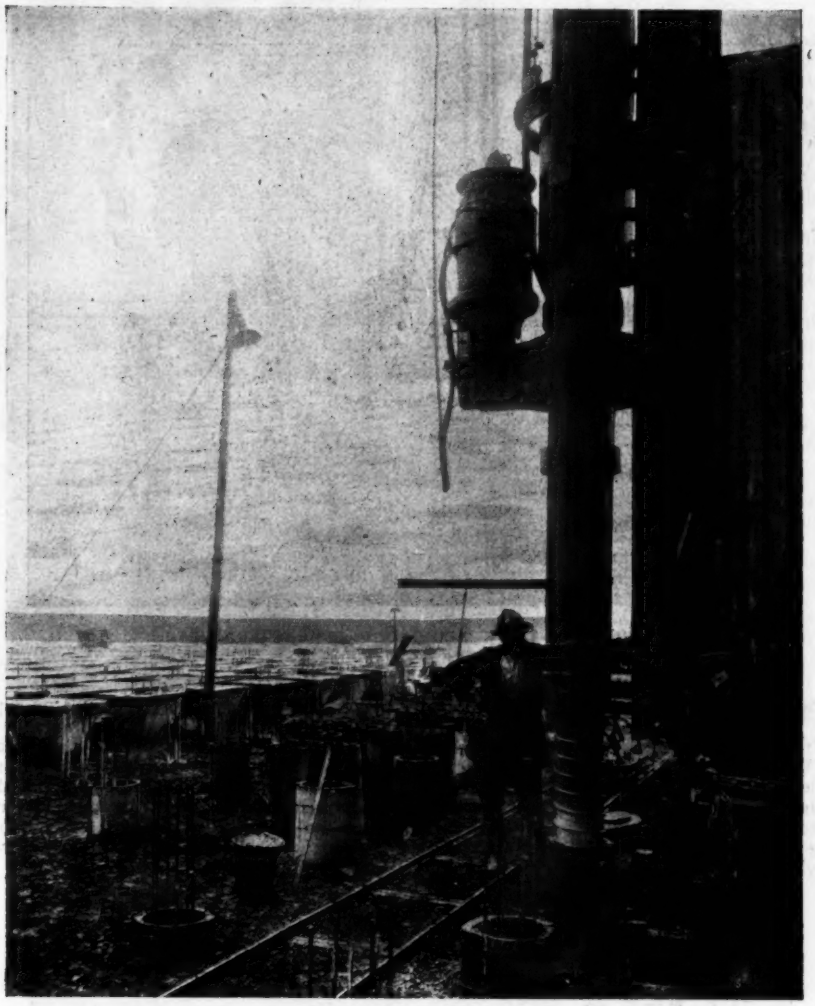
Mr. NORMAN S. COX (Sunderland) said that his Company had just taken down mains over the Wear Bridge that had been there for sixty years. He was present when the bridge was broken up; and the men slogged away with a big forehammer before they could break the main. The engineers were staggered to see what beautiful condition it was in, after being in the ground for sixty years. This showed that if cast-iron mains were laid in decent ground, they would last for a very long time.

Mr. C. F. BLINCOE (Middlesbrough) said that his experience was that where pipes were laid in good clay ground, they were still in excellent condition after fifty years' use, but where they were laid in made-up ground of slag, ashes, and so forth, they quickly corroded. Peaty soil, too, was detrimental to the pipes, the acids from the vegetable matter making the metal so soft beneath the surface that it could be cut with a knife.

Mr. BRADSHAW, in reply, said there was a great deal that had been omitted that he might have included had he had more time. A very important aspect which also called for research was the bacteriological effects on mains. Research might reveal valuable points which would lead to the necessary safeguards. He thanked Mr. Cox and Mr. Ridley for the provision of the lantern, which had helped his paper.

CONCRETE "SHELL" PILING AT LEICESTER.

Reprinted from "Concrete and Constructional Engineering."



PIPE PILE MAKING IN PROGRESS.

An interesting contract has just been completed for the City of Leicester Gas Department, at their Aylestone Road Gas-Works, where Messrs. West's Rotinoff Piling and Construction Company, Ltd., of Regent House, Kingsway, W.C. 2, have constructed the foundations for a large gasholder, which will be erected shortly by Messrs. R. & J. Dempster, Ltd., of Manchester.

The gasholder to be supported on the foundation is of the "spirally guided" type, and will have a capacity of 5 million c.ft. of gas. There will be four lifts, each 40 ft. deep. These lifts will be contained in a steel tank 214 ft. in diameter by 41 ft. 6 in. deep, which, together with the holder, will weigh upwards of 2000 tons. The holder and the water within the tank will weigh 45,000 tons, and the concrete foundations 2500 tons, making a total weight to be carried on the concrete piles of 47,500 tons.

Messrs. R. & J. Dempster, Ltd., obtained the order for the holder from the Leicester Corporation to drawings and specification provided by Mr. H. Pooley, M.Inst.C.E., the Engineer and Manager to the Gas Department.

Owing to the nature of the site it was found necessary to construct a piled foundation, the type of pile employed being the West's Rotinoff "Concrete Shell" pile. Our illustrations show the manner in which this pile is made. The system of operations is as follows:

(1) A precast concrete shoe is placed on the ground in the required position.

(2) The steel mandrel, which has a helical projection along its entire length, is lowered on to the top of the shoe, the contour of which conforms exactly to that at the bottom of the mandrel.

(3) One pair of the semi-circular precast concrete shells, which have internal grooves to correspond exactly with the helical projections on the mandrel, is placed in position on the mandrel resting on the shoe, and wired together. The shells are about 2 ft. long and can be easily handled by one man.

(4) The steam-hammer is then set in motion. This hammer drives the steel mandrel into the ground, driving the concrete shoe before it and taking the concrete shells with it.

(5) When the first pair of shells has nearly disappeared into the ground, a second pair is put on; the hammering is continued until this pair likewise almost disappears, when a further pair is put on, and the operation is repeated until the set is reached.

(6) After the required set is obtained the steel mandrel is unscrewed out of the shells by means of an electric motor, or steam engine, through reduction gears. This leaves nothing in the ground but the concrete shoe and the shells protecting the hole, and the consolidation of the soil obtained by driving the shells is fully maintained.

(7) A cage of reinforcement is lowered into the shells and the concrete core poured into the mould formed in the ground by the shells.

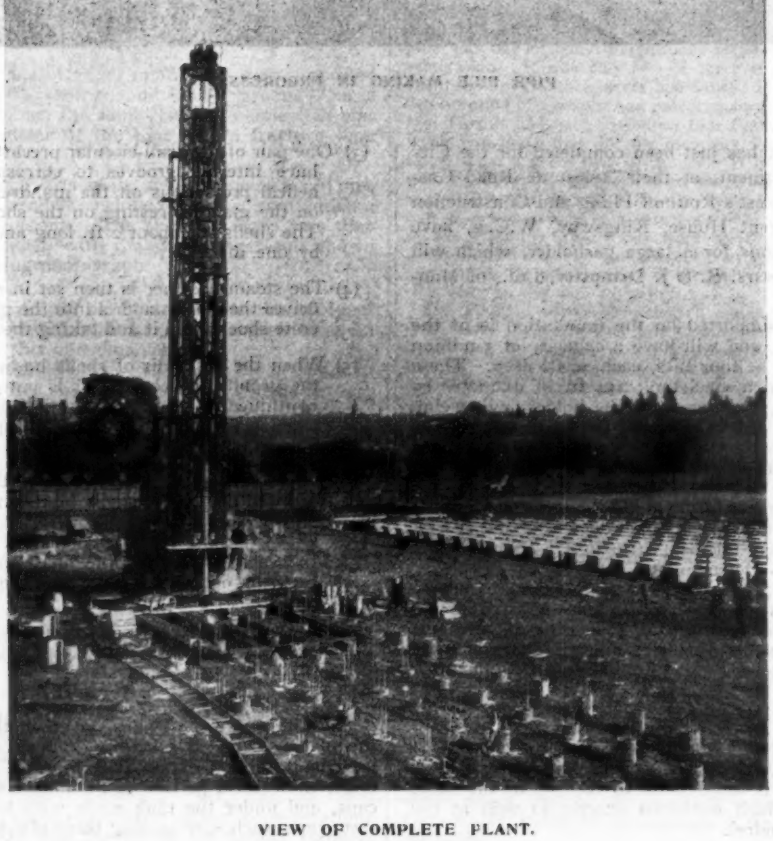
The total number of piles driven in this contract was 1316; the spacing being at 5 ft. 6 in. centres and the length averaging about 18 ft. 6 in. in the ground. The piles were capped under the central portion of the holder with single pyramidical caps, and under the tank walls with tapering reinforced concrete caps, each surrounding three pile heads. The foundation

FORMS OF THICK ALUMINOUS CEMENT CONCRETE.

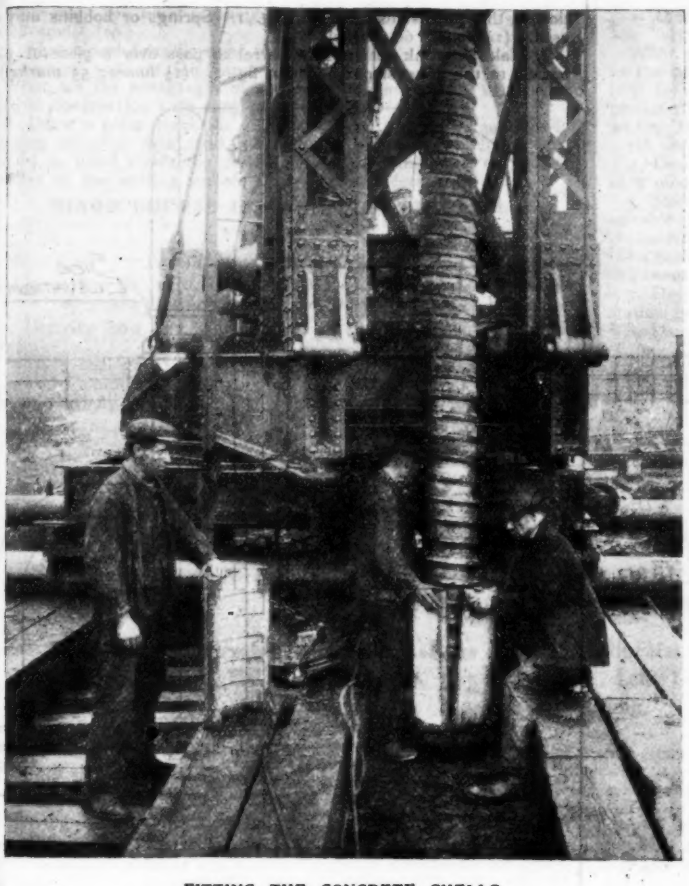
slab supported on these caps is 7 in. thick, and is reinforced in both directions.

Owing to the extremely small headroom (2 ft.) between ground-level and the underside of the 7-in. slab, it would have been almost impossible to strip timber formwork to support this slab even if the shutters had been arranged on travelling carriages. The contractors got over this difficulty in an ingenious manner by using forms of 1¼-in. thick aluminous cement concrete, reinforced with rabbit wire and left in place after the 7-in. slab was poured. In order to support these slabs the faces of the pyramids were continued.

The contractors also showed their readiness to adopt new methods with the aim of decreasing costs by using concrete forms for the faces of the 1000 pyramids. These forms, the semi-circular shells, and the concrete forms for the slab were all made on the site by mass production methods. No fewer than 23,000 shells were required on this contract. The method of making these shells is as follows :



VIEW OF COMPLETE PLANT.



FITTING THE CONCRETE SHELLS.

Copper moulds of the shape of the insides of the shells are laid out on benches, and hinged metal sides and ends placed in position. Fine aluminous-cement concrete is then laid on to half the thickness of the shells. A sheet of No. 5 expanded metal bent to shape is then placed on top of this concrete, and the remaining half of the concrete plastered on with a trowel. After screeding off, the surface is smoothed off with a metal trowel. The concrete is allowed to harden for 24 hours, when the shell can be removed and placed in the stacking ground.

During our visit to the job several piles were driven; and the following points attracted our attention as advantages of this system of piling: (*a*) The original compression of the ground caused by the driving is maintained; (*b*) the hole can be inspected right down to the shoe; (*c*) the exact size of the pile is known, and therefore the concrete can be stressed to its fullest extent; (*d*) as the concreting is carried out by a separate gang, great speed of operation can be obtained; and (*e*) all the operations are carried out at ground level. The cost, we are informed, compares very favourably with any other system of piling.

A test load of 200 tons on four of these piles gave no appreciable settlement. The test load was applied in such a manner that the concrete slab carrying the load will be part of the new foundation slab.

Mr. Burnard Geen, M.Inst.C.E., the Consulting Engineer for West's Rotinoff Piling and Construction Company, Ltd., was responsible for the design and supervision of the whole of the reinforced concrete work in this foundation, which was carried out by the above-named firm as sub-contractors to Messrs. R. & J. Dempster, Ltd.

MISCELLANEOUS NEWS.

CITY AND GUILDS OF LONDON INSTITUTE.

The following questions were set in the City and Guilds of London Institute 1929 Examinations in the subjects named:

GASFITTING.

GRADE I.

Monday, April 22, 7 to 10 p.m.

(*Not more than six questions to be attempted. The maximum number of marks obtainable is the same for each question.*)

1. Sketch a 6-in. **U**-tube pressure gauge showing 30-tenths pressure water column, and a 6-in. **U**-gauge filled with mercury showing a pressure of 1 lb. to the sq. in.

2. What are the advantages of using a governor?

3. Give the cubic contents and weight when filled with water (excluding weight of metal) of: (*a*) A hot water cylinder, 30 in. high by 18 in. diameter; (*b*) a rectangular hot water tank, 24 in. by 24 in. by 18 in. deep.

4. Give a complete list of tools and material necessary for: (*a*) Fixing a 5-light meter to an existing ¾-in. service and ¾-in. supply pipe; (*b*) fixing a 10-in. gas fire to an existing ½-in. point at the side of a fire-place; (*c*) fixing a gas cooking stove, on a wood floor, to an existing 1-in. point at the floor line. (Size of cooker float, ¾ in.)

5. Describe in detail, with the aid of sketches, how you would proceed to fix: (*a*) A 3-light pendant in the centre of a room to an existing ¾-in. barrel gas supply under the floor above, (*b*) a similar pendant to an existing ¾-in. compo supply under the floor above.

6. Explain the difference between seamed and solid drawn brass tube. Which would you recommend for making gas pendants and brackets, and why?

7. Give the composition of the following alloys: (*a*) Brass suitable for making main cocks; (*b*) plumber's solder; (*c*) tinman's solder; (*d*) blowpipe solder.

8. What is the approximate gas consumption in cubic feet per hour (500 B.Th.U. gas) of the following: (*a*) A circulating boiler suitable for a 20-gall. storage tank; (*b*) a domestic gas iron; (*c*) a bijou inverted burner; (*d*) a 10-gall. domestic wash copper; (*e*) an outside lamp with seven medium mantles on superheater?

9. Describe how you would carry out the following work, and what material and tools you would use: (*a*) Flanged joint on a meter; (*b*) ¾-in. lead saddle joint; (*c*) cutting out and inserting a ¾-in. equal tee on a ¾-in. supply.

GRADE II.—WRITTEN PAPER.

Monday, April 22, 7 to 10 p.m.

(*Not more than six questions to be attempted.*)

1. Sketch one form of constant pressure governor suitable for use on the outlet of a meter.

2. Sketch one form of lighting burner with which you are acquainted, and state what you would recommend a consumer to do so as to get the utmost from the burner.

3. Describe, with the aid of a sketch, how you would test a gas installation for soundness: (*a*) with gas available; (*b*) with no gas available.

4. By means of simple sketches describe the action of a dry meter, and name the various parts.

5. What is the difference between "open" and "closed" type geysers? Sketch the flue arrangement you would provide for their ventilation.

6. State how you would exchange a defective 1-in. main cock on a "live" service, and what precautions you would take in carrying out this job.

7. Show, by means of sketches, how you would fix and supply gas to outdoor lamps over a shop fascia.

8. Sketch in simple outline a gas-heated hot water circulating system. Show where you would fix the cut-out valve and thermostat and how you would gain access to the boiler for cleaning purposes.

9. State what precautions you would observe in fitting a flue pipe to a gas oven.

GRADE II.—PRACTICAL EXAMINATION.

Saturday, April 20, 2.30 to 6.30 p.m.

(*Candidates must attempt all questions.*)

1. With the materials provided make up a 1-in. diameter meter connection to the dimensions shown in fig. 1. Springs or bobbins may not be used. (*1¼ hours; 55 marks.*)

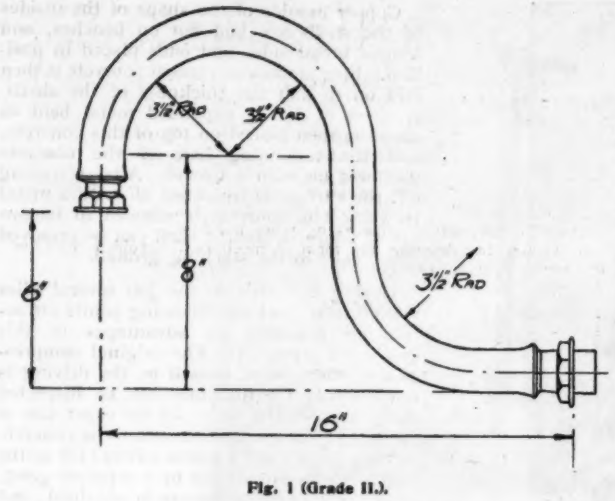


Fig. 1 (Grade II.).

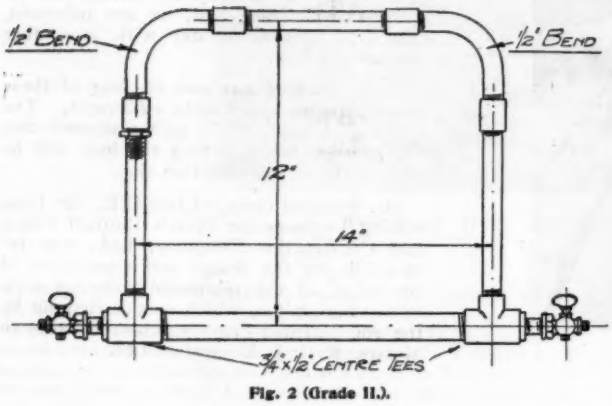


Fig. 2 (Grade II.).

2. Make up barrel connections to the dimensions shown in fig. 2. Test for soundness with pressure gauge. (*1 hour; 55 marks.*)

3. Fix the portable pressure recorder to the point provided with a rubber connection, and leave in working order. Check the pressure recorded, report to the examiner, and state in what circumstances you would use one. (*½ hour; 15 marks.*)

4. Fix the 10-in. gas fire to the point with ½-in. brass tube, which must be set over the wood block representing a curb. Fit up and adjust the burners and leave in working condition. (*1 hour; 45 marks.*)

5. Fix the 5-light superheater type of outside lamp to the point, complete with safety chains. Replace the burner and superheater, and adjust to give correct flame. Explain to the examiner what steps you would take to prevent the lamp becoming accidentally unscrewed from the lamp arm. (*½ hour; 30 marks.*)

FINAL EXAMINATION.—WRITTEN PAPER.

Monday, April 22, 7 to 10 p.m.

(Not more than six questions to be attempted.)

1. What are the causes of, and how would you remedy: (*a*) an offensive smelling gas cooker; (*b*) a gas fire that lights back?

2. Sketch and describe a 3-light (medium mantle) outside lamp, superheater type, and state how it differs from an inside lamp. Name the various parts, and show by means of arrows how the primary air and secondary air flow into the lamp, and how the products of combustion are conveyed away.

3. What do you consider are the advantages and disadvantages of fixing a governor: (*a*) on the main gas supply; (*b*) on each separate piece of apparatus? What would you recommend should be done to keep a governor in good order?

4. How would you deal with the following defects: (*a*) water in service; (*b*) naphthalene in service; (*c*) oscillating gas pressure due to a gas engine working nearby?

5. Supposing you have fitted a geyser, what tests would you apply before passing it as suitable for use?

6. Describe briefly the difference between a "lights" meter and a "high-capacity" meter. Give sketches to illustrate your answer.

7. State the various purposes for which thermostats are used, and sketch one with which you are acquainted.

8. Describe some form of flueless gas stove with which you are acquainted, and state what you would do to ensure its satisfactory working.

9. Sketch and describe some form of distance lighting valve. What points need attention to make this device reliable?

FINAL EXAMINATION.—PRACTICAL TESTS.

Saturday, April 20, 2.30 to 6.30 p.m.

(Candidates must attempt all questions.)

1. With the materials provided make up the 1¼-in. meter connection to the dimensions shown in fig. 1. Springs or bobbins may be used. (*1½ hours; 60 marks.*)

2. Make a crank set in 1-in. barrel to pass over a piece of 3-in. barrel, to the dimensions shown in fig. 2. (*1¼ hours; 55 marks.*)

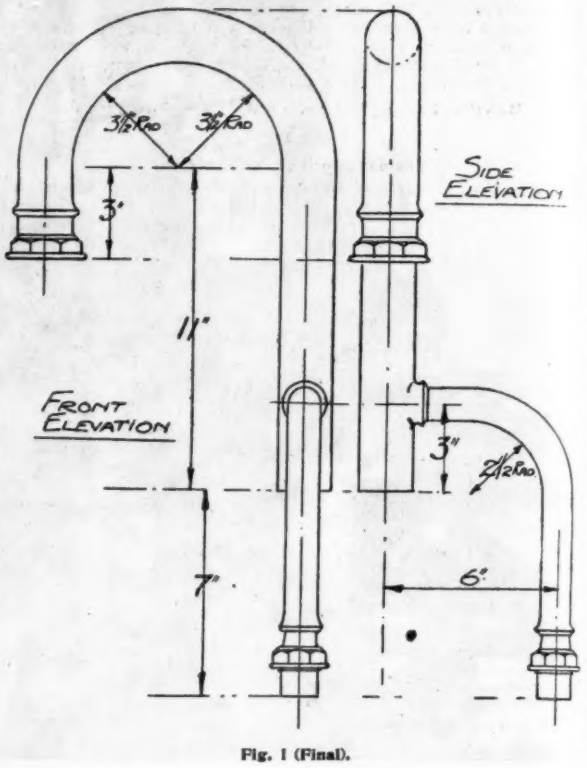


Fig. 1 (Final).

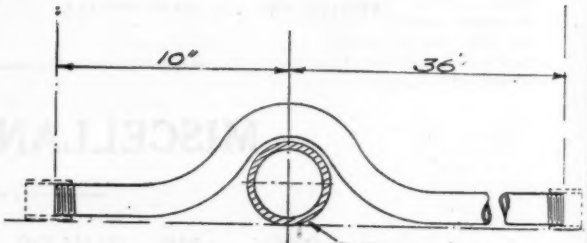


Fig. 2 (Final).

3. Replace all burners and fittings on the cooker, examine the governor fitted on the cooker supply, and adjust the burners to a pressure given by the examiner. (*½ hour; 30 marks.*)

4. Examine the 3-light superheater type of outside lamp fitted with a distance control device. Adjust the burners on the lamp to give the correct flame, also adjust the by-pass. Explain briefly to the examiner the action of the distance control valve. (*½ hour; 35 marks.*)

5. Examine the 120-ft. high-capacity meter and answer the questions put to you by the examiner. (*½ hour; 20 marks.*)

MINOR COURSE IN GAS SUPPLY PRACTICE.

Tuesday, April 23, 7 to 10 p.m.

(Not more than six questions to be attempted.)

1. High-capacity meters are now being extensively used. State their advantages over the ordinary type of dry meter, and in what respects they differ constructionally. (*30 marks.*)

2. Sketch and describe a suitable valve for the distance control of gas lamps or gas burners. (*20.*)

3. Sketch and describe the different ways of arranging radiants in modern gas fires, and show by diagrams how they differ in the distribution of the radiant heat omitted from them. (*30.*)

4. What points in material and construction need to be considered in the manufacture of:

(*a*) A one-light pendant,
(*b*) A modern outdoor lamp.

so as to ensure the quality with regard to efficiency, reliability, and economical maintenance? (*20.*)

5. Describe fully, and sketch, a thermostat suitable for controlling cooking operations in gas ovens. Where is the thermostat usually placed in the oven, and why? (*20.*)

6. Gasfitters sometimes find the following deposits:

(*a*) Incrustation in the water chamber of circulating boilers;
(*b*) Rust in service pipes.

State what you know of the causes of these and how their removal is effected. (*20.*)

7. Sketch and describe some form of circulating boiler (gas-heated) with which you are familiar.

What are the advantages of a thermostat and cut-out valve when used in conjunction with such an appliance? (*30.*)

8. Draw a polar curve for a lamp that you regard as suitable for lighting an office desk, and calculate the height at which the lamp should be fitted above the desk to give an illumination of 10 foot-candles on the writing surface immediately underneath. (*30.*)

MINOR COURSE IN GAS-WORKS PRACTICE.

FIRST PAPER.

Tuesday, April 23, 7 to 10 p.m.

(Not more than six questions to be attempted. The maximum number of marks obtainable is the same for each question.)

1. Describe how you would ascertain the quantity of ammonia present—

(*a*) In coal gas,

(*b*) In ammoniacal liquor,

and state briefly the difference between free and fixed ammonia.

2. Describe with the aid of sketches giving approximate dimensions any form of horizontal retort setting.

What weight of coal per 24 hours would you expect to carbonize in the setting you describe?

3. (*a*) Explain the reactions which take place in a gaseous fired producer of a horizontal retort setting, and give the equations representing these reactions.

(*b*) Give the approximate composition of a good producer gas.

4. Describe with the aid of sketches the construction and working of a modern carburetted water gas plant.

5. Sketch and describe an arrangement of oxide of iron purifiers suitable for purifying one million c.ft. of gas per diem.

Describe the method of working these purifiers.

6. Sketch and describe any form of mechanical scrubber used for the removal of ammonia.

7. Describe with the aid of a sketch any well-known form of station governor, and explain its method of working.

8. Describe the tests for—

(*a*) Spent oxide.

(*b*) Sulphur compounds other than sulphuretted hydrogen in town gas.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

Annual General Meeting.

The 181st Ordinary General Meeting of the Imperial Continental Gas Association was held at Winchester House, Old Broad Street, E.C., on Wednesday, May 29—Col. H. LeROY-LEWIS, C.B., C.M.G., D.S.O. (the Chairman), presiding.

The CHAIRMAN: I will now ask the Secretary to read the notice convening the meeting and the Auditors' certificate. But before I do that, I should like to utter one word of apology to the Proprietors for having called them together at this unduly early hour of the morning. The real facts of the case are that it is not entirely our fault. The fault actually lies with the Imperial Parliament for delaying until the last moment the approval of our Bill. We did not know until the morning of the 10th inst. whether or not the Bill had passed, and that made a great difference to the time of meeting. As a matter of fact, we had already booked the hall for last Wednesday fortnight, but it was impossible to hold the meeting then. When we came to revise the time of the meeting, we found all the halls in the City were fully occupied, so we had no option but to call you at the time we have done. For this we tender our humble apologies.

THE SECRETARY (Mr. W. E. Bowers) then read the notice of meeting and the certificate of the Auditors.

THE CHAIRMAN: Ladies and Gentlemen,—As the Report and Accounts have now been in your hands for some days, I presume that you will wish to assume that they have been read. I shall therefore proceed to move the first resolution on our Agenda, that the Report and Accounts be received and adopted, making thereon some remarks on the operations of the past year, and awaiting the comments which any Proprietor may care to make.

As you will have seen from the Report, the Association is the poorer from the passing of its late Chairman, Sir Charles Jessel. When I had the honour of addressing you on the occasion of our Extraordinary Meeting in February last, I endeavoured to convey to you how great was our sense of this loss, and I would only add to-day that the passage of time serves but to increase our respect for his unremitting labours on behalf of the Association.

I must apologize for the absence of our Deputy-Chairman—Sir Henry Birchenough. As many of you know, Sir Henry is President of the Chartered Company of British South Africa, and he is now in Rhodesia in connection with the affairs of that great Company. I know that he deeply regrets he is not able to be here to-day. A further absentee is my son, who is abroad upon the business of the Association.

When we met at the end of February we were assembled to consider a Bill to co-ordinate and amend the Association's powers. That Bill passed through all its Parliamentary stages, with minor amendments, in almost record time, and received the Royal Assent on May 10. We deemed it advisable to depart from our usual practice of holding the Ordinary General Meeting not later than the middle of May in order to avoid summoning you together on two separate occasions, once for the purpose of this Meeting and again at a later date for the purpose of increasing the capital under our new statutory powers.

The Bill was explained in full at our last Extraordinary Meeting, and I do not propose to waste your time by travelling over the ground again. I merely intend now to remove certain erroneous ideas which appear to be in circulation. Briefly, the purpose of the Act is to co-ordinate our powers, which were scattered throughout a series of enactments dating from 1845; to define these powers on many points, the interpretation of which was open to doubt; and to bring them up-to-date—that is to say, into line with those which an ordinary limited liability company would enjoy. While other companies have been speeding along, we were forced to pursue a stately progress limited to the walking pace of a man with a red flag. Perhaps in the past we have sometimes unintentionally run down the flag-bearer, but now that we have the full freedom of the road, we have no intention of exceeding the speed limit, which it would perhaps be necessary to do to keep pace with the extravagant expectations formed in certain quarters as to our present and future prospects. We know the maximum speed of which our engine is capable, but we ask you to trust our judgment as to the speed beyond which it would not be prudent to drive.

The first effects of our new Act are already apparent in the simpler procedure for summoning you here to-day, and in the proposals which we submit to you for increasing the capital. Under our new Act, no limit is fixed to the amount of capital which we may raise subject to the consent of the Proprietors, and we therefore enjoy a power which Parliament has but rarely granted. In order to enable you to appreciate how valuable our new power is, I would point out that under each of our old Acts a definite and somewhat narrow limit was fixed to the amount of the capital we were authorized to raise. When our fixed capital powers were exhausted, it was necessary to apply on each occasion to Parliament for a fresh Act to increase our authorized capital, and in normal times such an Act would take from twelve to eighteen months to obtain. Now if it is deemed advisable to raise the authorized capital, all that is necessary is that you Proprietors in General Meeting should pass a Resolution to that effect. Not unnaturally, certain conditions are imposed as to the terms upon which such capital may be offered for subscription, and the Inland Revenue's claim to a duty of 1 p.ct. upon the new capital created must be satisfied. The important point is, however, that if we wish to undertake fresh business, we have not to resort to the temporary, and perhaps expensive, expedient of borrowing the necessary capital, while awaiting the sanction of Parliament to an increase in our authorized capital, but can come to you at once with our proposals.

We are submitting to you to-day a proposal to raise the nominal capital from £1,976,000, the amount now actually issued, to £3,000,000 by the creation of £1,024,000 of fresh capital, of which £524,000 is to be offered for early subscription at the price of 200 p.ct., so bringing the issued capital up to £2,500,000. I have heard criticism passed on the Board's proposals to the effect that capital ought to be returned to the Proprietors rather than fresh capital created, or, alternatively, that a free capital bonus ought to be distributed. The facts of the case are that for some time past the Association has been over-spent on capital account, as all expanding enterprises tend to be. Our associated companies have big programmes in hand, and we have been forced to finance these by bank loans and by the sale of investments. This position ought to be regularized as soon as possible. It is true that we could still further reduce our investment fund, but I think this would be a mistake; it should be our policy not to concentrate too exclusively on one or two countries, and to have a few selected eggs in baskets not labelled gas or electricity. We can employ to advantage the £1,048,000 of fresh money which you are to be invited to subscribe. I would prefer to ask you for this fresh capital rather than submit proposals for returning capital to you. The former course denotes expansion; the latter course might well indicate stagnation, for "He who soweth little shall reap little, and he that soweth plenteously shall reap plenteously."

To the critic who urges that a free capital bonus ought to be distributed, may I be permitted to point out that our profits would remain the same, and that we should merely have paid Stamp Duty for the privilege of increasing the number of divisors of that profit. The only way possible to justify the issue of a capital bonus would be to write up the book value of some of our investments, which course might perhaps be permissible if we consider the present market values, but would be adopting the policy of the bird in the bush, a fertile source of disillusionment in our time and one which your Board will never prefer to the solid benefits of the bird in the hand; if and when the bird is ever handled, that will be the proper time to talk of a capital bonus. There may, however, be a feeling among

the Proprietors that the Stock has, owing to its high price, become too heavy; if so, we would be prepared to consider the question of approaching the Stock Exchange to quote our Stock in £1 units.

If you approve our proposals, you will receive your letters of rights to this £524,000 of new Stock on June 18, together with your dividend warrants. Of the amount due, 10 p.ct. will be payable on application, a further 15 p.ct. on allotment, and three instalments of 25 p.ct. each on Oct. 15, Jan. 15, and March 31 next. Each £100 of existing Stock will entitle the holder to apply for £26 10s. of new Stock, and *pro rata*. In addition to his fixed right, each stockholder can apply for an allotment of Stock not taken up. As the Stock can only be registered in multiples of £1, fractions of £1 will not be allotted to the Proprietors, but will be dealt with by the Board in such a way as to give the staff an opportunity to make an investment in the Association. Intercalary interest will be paid on the instalments at the rate of 4½ p.ct. per annum. The new Stock will obviously not entitle the holder to any rights, whether of a capital dividend or bonus nature, until after March 31, 1930, when it becomes fully paid and will rank *pari passu* in all respects with the existing Stock. I may here mention that it is our intention to close our accounts on March 31, 1930, in order to enable the dividends of our subsidiary companies, which will be declared after Dec. 31, to be brought into our next accounts. We shall therefore have a fifteen months' year, and consequently our General Meeting may be slightly delayed; but after next year we shall settle down to twelve months, always closing on March 31. Apart from the special circumstances which render necessary a change in our closing date, it will be a great convenience to close on March 31, so that the Association's accounting year coincides with the fiscal one, a change much appreciated by our office staff.

You will see that the accounts which are before you take a different form from that to which you are accustomed. The changed method of presentation is a natural consequence of the evolution of the Association from an operating into a holding Company. I use the word "evolution" very deliberately, for, though the culminating effects of this change are prominently before us to-day, the change has in reality been a gradual and involuntary one, if you admit the necessity for adaptation to environment.

It was recognized as a governing principle by the Board of the Association before the war that the operation of public utility services abroad as direct branch establishments of an English Company had become an anachronism, and that while an organization such as the Association has built up might have its uses in the past, yet now local capital and local interests ought to be given the opportunity to associate themselves with our undertakings. If we do not, of our own initiative, recognize the changed conditions under which the world lives, recognition may be forced upon us in a manner not desirable in your interests.

Some of you may remember that in deference to this feeling the following changes were made before the war: Our Hungarian interests were incorporated in a Hungarian Company; the Compagnie Continentale du Gaz was formed to absorb our French undertaking; our Station at Frankfort was constituted as a German Company in 1909; and at the time of the outbreak of war steps were about to be taken to convert our Berlin Station into a German Company. No similar measures were taken with regard to our Belgian Stations, largely because everything cannot be done at once. After the war, the reasons for carrying through this programme to completion were far greater, owing to the strong feelings of nationalism which war engenders. While exchanges were depreciating, it was obviously necessary to stay our hand, but now that objection has disappeared, your Board have continued the pre-war policy, and converted the Belgian enterprises into local companies. We have reason to believe that this step has met with general approval in Belgium, and, if that is the case, a consolidation of your interests will ensue. It will be our policy to allow our Belgian friends to take up a substantial interest in these companies and, in fact, to seek to create a real community of interest.

In consequence, the Association is assuming more the character of a holding Company, and various items appearing in the old form of accounts have had to be altered or to disappear.

I now propose to explain the accounts and the changes in the method of presentation which our Accountants' Branch, acting in consultation with a leading firm of professional accountants, have thought it desirable to introduce in the hope of avoiding the obscurity which lurks in over-elaboration of detail—detail which has besides for the most part become meaningless owing to our changed method of operation. The new form of account may, perforce, be lacking in some of the detail dear to the expert, but what the expert has lost the inexpert has gained, for we have already received definite evidence that the lay Stockholder has been enabled to form a truer appreciation of the position of the Association. It will, however, be my endeavour in the course of my explanation of the accounts to give the expert every satisfaction.

Taking the creditor side of the Profit and Loss Account, the first item is Net Revenue from Stations: This item shows the satisfactory increase of £154,000 compared with last year; the increase is chiefly due to improved trading, partly the result of the expansion of our business, and also of the more normal economic conditions under which we are now working. The year has also benefited from the fact that, in order to prepare the way for the formation of our subsidiary companies in Belgium, there was an adjustment of meter readings so as to start completely clear on Jan. 1 of this year. This adjustment was to the advantage of the 1928 accounts, and naturally will not recur. The item "Net Revenue from Stations" will probably be of very small importance in our next accounts, for, as these Stations become subsidiary companies, dividends will take the place of Stations' revenue.

These dividends will naturally not be of the same magnitude as the net revenue which is at present credited in our accounts, but, on the other hand, the Association will not have to provide amortization and other reserves, as these companies will create their own reserves, so that on balance the final result should be very much the same for the Association.

I must warn you, however, that, despite the longer period, I do not anticipate that the results of the accounts for the next fifteen months will look very different from the accounts which we present to you to-day, for had we continued on the present basis, with a a twelve-month year, we should have brought into our accounts the results of the trading operations of our Stations for the twelve months ending on Dec. 31 next, whereas now, under the changed procedure, our accounts will, by way of exception for next year, be kept open for a period of fifteen months, but they will naturally only include the dividends which these subsidiary companies will declare in respect of their trading operations for a period of twelve months.

The next item, dividends, interest, and sundry revenue, shows an increase of £28,000 on last year's figures. This increase is due to the operations of our small English associated company, the Utility Loan Company, whose first year of trading has been very satisfactory.

The other factor which has contributed to swell this item is the receipt of a larger dividend from the important French Company in which we are interested, the Compagnie Continentale du Gaz, in France. Since the close of the accounting year, the nominal capital of this Company has been doubled, and 25 p.ct. of the new nominal capital has been called up, the Association naturally taking up the full proportion of shares to which it was entitled. This necessitated the disbursement of a large sum of money by the Association, and is a contributory cause to the state in which we find ourselves to-day of being over-spent on capital account. Our holding in the Compagnie Continentale is a valuable asset, and we can, I think, confidently anticipate the receipt of increased revenue from this source during the current year.

Turning to the Debtor side of the Profit and Loss Account, the first item, "Administration and General Expenses," shows an increase, owing to the increased provision which has had to be made for taxation in consequence of the higher profits which we have earned.

Interest on Debenture Stock shows a slight reduction, owing to the purchase by the Association of its Debenture Stock in the market for cancellation.

Amortization shows a reduction of approximately £20,000, owing to the fact that our Brussels Power Station has been transferred, against shares, to a Belgium Company which has been formed for the production of current in and around Brussels. In consequence of the exchange of this asset against an investment, no provision for ordinary amortization is necessary, as the Company in question provides its own amortization fund.

For the various reasons which I have mentioned, the Profit for the Year carried to Appropriation Account shows an increase of £170,000 upon the corresponding figure for last year.

After adding the balance of the last Account and deducting the final dividend for 1927 and the interim dividend of 5 p.ct. paid in November last, the balance to be carried to the Balance Sheet is £428,466, which shows a substantial increase upon the figure of £199,286 for the previous year.

The Balance Sheet, you will see, is a very abbreviated document this year. Taking the assets side, I would point out that the first item is a combination of what you have been accustomed to find as three separate items—namely, Works, Mains, &c.; Freehold Land forming the Sites of Works; and Freehold Property in London and abroad. The bulk of these items represents assets which have since been ceded to our subsidiary companies against shares, and there is therefore an obvious advantage in grouping them together. Naturally, this item will undergo a considerable shrinkage in our next accounts, but investments should show a corresponding increase.

Comparing the composite value of this asset with the total of the three corresponding items in last year's accounts, you will find that there has been a decrease of £276,000, which is due principally to the fact that our Brussels Power Station has been merged with the Power Station of a neighbouring group in a newly formed Power Company. From this Company, the Interbrabant, all the electrical distributing companies in and around Brussels will take current, and the capital has been subscribed by the distributors on the basis of estimated consumptions. We have an important share in virtue of our Brussels distribution. Substantial economies are being effected as the result of production in common, and the prospects of this Power Company are good.

Naturally, the result of this merger has been to decrease the item Works, &c., by the value of our Brussels Power Station and to increase investments by the value of the shares received in exchange. We have, in addition, received a substantial sum in cash, but you will not find this represented by cash in the accounts, as it has already been spent either on Works' extensions or has been lent to our associated companies to enable them to finance their programmes.

The Brussels Power Company, although it has been in existence only just over one year, has already found it necessary to increase its capital from Fcs. 110,000,000 to Fcs. 175,000,000, to enable plant to be installed to keep pace with the rapidly increasing output. Your Board naturally took up all the shares to which they were entitled. That is typical of the way the money goes, but you may accept my assurance that it is money well spent, and that future accounts will derive benefit from such expenditure.

The dividend which we have received from the Interbrabant does not appear in these accounts, as it was declared after Dec. 31, and also the call upon our Interbrabant shares does not figure in the accounts before you.

The decrease of £276,000 under the head of Works, Mains, &c., does not represent the full decrease due to the cession of our Brussels Power Station, for, *per contra*, we were busy during 1928 expanding our directly controlled enterprises, and this involved us in new capital expenditure amounting to £127,000.

Stocks at Stations show a decrease of £15,000, principally owing to the transfer to the Interbrabant of Stocks connected with the exploitation of our Brussels Power Station. For the reasons I have given you in regard to Works and Mains, Stocks will tend to dis-

appear from our next accounts, but we have thought it advisable not to include them in the item above, as good accountancy demands that assets of a fairly liquid nature should be shown as distinct from fixed assets.

Sundry Debtors show an increase of £400,000, which principally represents advances which we have made to our associated enterprises. Since the close of the last accounting year, this item has grown still more, and will continue to grow. The security for these advances is indisputable, and the rate of interest satisfactory to both borrower and lender, a somewhat rare combination.

Cash and Short Loans is a combination of two items appearing in the old form of accounts. Clearly there is no justification for maintaining a distinction between cash and money lent in the discount market, as both are available either at call or at very short notice for the development of the business. This item shows a decrease of £135,000 upon the two corresponding figures in the last accounts. I make no apology for this decrease; I rejoice in it, knowing that this money has been put to good use in the development of our undertakings. Since the close of last year our Treasury has become still more impoverished, and I think the general trend of my remarks will have served to convince you all of the necessity for calling up fresh capital; in fact, the only alternative would be to arrest our programme of expansion.

We have had to use monies accruing as revenue for the purpose of financing our Capital Account; this revenue must ultimately be reinstated out of the new capital for which you will be given the opportunity to subscribe.

Investments stand in our books at the moderate figure of £2,585,000, which is an increase of £306,000 upon last year, the increase being due to our investment in the Interbrabant and various other Public Utility Undertakings.

It may be objected that our English, Colonial, and Indian Securities are now shown in one item together with the Foreign Gas and Electricity Companies. Were the former all gilt-edged securities there might be some reason for this view, but as all these investments are essentially of a cognate character, there can be no point in showing them separately. In so far as they may be gilt-edged securities it is somewhat misleading to show them separately, for it is from this fund that we finance our extensions and development, so that when the fund is low we are probably in the midst of an active period of profitable business, whereas if they are high our business is not active; but anyone noticing a reduction in these securities might be tempted to draw quite a wrong inference from the fact.

Some of you may think that our investments stand at a very moderate figure having regard to the Bourse valuation of our investment in the Compagnie Continentale du Gaz in France. I do not dispute this, but it has always been the general policy of your Board to write down depreciated investments, and never to write up appreciated ones. In this item we have a substantial "cellar" reserve, the existence of which must be a source of considerable gratification to you Proprietors. In so far as increased dividends are paid on our French investment, you will receive the benefit through the larger sums available for distribution, but no possible advantage could accrue to you from writing up this investment to a figure more commensurate with its present-day market value.

On the other side of the Balance Sheet our Capital Stock remains unchanged at £1,976,000. On previous occasions we have shown authorized capital of £2,376,000, which was the authorized capital fixed by Parliament. Under our new Act, Parliament has cancelled the statutory margin of £400,000 authorized capital, and leaves you Proprietors in General Meeting free to fix, from time to time, the capital which the Board are authorized to raise.

As I have already explained, we are asking you to approve the increase of the authorized capital to £3,000,000, and to issue forthwith a further £524,000 nominal capital, which will leave us with £500,000 of capital in reserve to be issued as and when the development of the business calls for it.

3½ p.ct. Debenture Stock and Premium on Redemption shows a decrease of £6000, owing to the redemption of Stock by purchases in the market.

Sundry Creditors shows an increase of £585,000. This increase is, however, more apparent than real, for we have this year grouped under the head of Creditors everything which is a liability to third parties. Included under this head are therefore the following items, which appeared separately in the old form of accounts:

Sundry Stockholders: Amounts unclaimed account reduction of Capital.
Interest accrued on 3½ p.ct. Debenture Stock.
Dividends unclaimed.
Taxation Reserve, which lurked among Credit Balances.
Commissioners of Inland Revenue.
Pension Reserve.
Sundry Creditors.

If you compare the total of these various items in our Balance Sheet on Dec. 31, 1927, with that which is submitted to you today, the real increase is only £108,000, which is chiefly accounted for by the larger sums owing to Contractors for extensions of plant now being carried out. In short, we owe more money now than a year ago, and, as you will have gathered from my remarks in regard to the other side of the Balance Sheet, we have less cash with which to meet this liability.

Apart from our trade creditors, our debt to the Inland Revenue is larger owing to the higher Income Tax claim which had to be satisfied in the early months of this year, as compared with the corresponding claim which fell due to be paid in the early months of 1928. I see no objection to such an increase so long as it is caused by larger profits and not by an increase in the rate of Income Tax.

As regards the other items which this year are included under the head of Sundry Creditors, I do not think I need tarry over the amounts unclaimed in respect of the reduction of Capital which took place in 1921, but I may mention that there is still a sum of £1760 owing to altruistic Proprietors, and Dividends Unclaimed falls into the same category.

Interest on Debenture Stock represents the accrued interest up to Dec. 31 last.

From Credit Balances we have lifted out the item of Taxation Reserve £69,000, and placed it among Creditors, as this is cover for claims which may be made for additional tax by the Fiscal Authorities, either here or in the countries where our operations are carried on. After this year our position should be clearer, and in this case some part of this taxation reserve will be released.

We now come to Pension Reserve. I understand by a reserve a surplus of assets which is available after repayment of the Capital and the satisfaction of all debts owing to third parties. I consider our pension reserve as representing a debt which is, in effect, owing to our Staff as cover for their pensions, and therefore I think that the term "reserve" is a misnomer. In my opinion this item is more correctly placed amongst creditors.

Owing to the conversion of our foreign stations into local companies, the amount of our direct pension liability to our Staff will decrease, but the Association will naturally have to transfer to these new companies a capital sum to cover its liability in respect of the existing pensions and the accrued liability to pensions in respect of the Staff taken over by them. Calculations are in process of being made, and I think it unlikely that after providing for our pension liabilities to our Subsidiary Companies and reserving a sum for our own direct pensioners and Staff, any additional provision will be necessary beyond the £532,000 3½ p.ct. Conversion Loan which was earmarked as a pension fund investment in our previous Balance Sheet.

General and Specific Reserves covers the following items in our old form of accounts:

Premium on Stocks.
General Amortization Account.
Credit Balances, with the exception of Taxation Reserve, which has been placed among Sundry Creditors.
Renewals Fund.
Exchange and Contingency Account.
Reserve Fund.
Proprietors' Fund.

The figure given in our present Balance Sheet shows a decrease of £51,630, compared with the total of the different Reserves in our previous accounts which I have just enumerated. This decrease is due to the fact that the cash and the shares at nominal value which we received in respect of our Brussels Power Station fell short of the figure at which that Power Station was included under Works and Mains, perhaps to-day we could sell our shares at a figure which would show a profit upon their nominal value. This is, however, conjectural, and therefore, instead of writing up the value of our investment, which would be quite contrary to our practice, we have drawn upon the fund which exists to meet such an emergency—*i.e.*, our Renewals Fund—for you must not think, because our Reserves are shown to you in bulk, which enables you to form an appreciation of the position of the Association without resort to sums of addition, that the detailed reserves which are gathered under the item General and Specific Reserves have ceased to retain their independent existence in the Books of the Association.

There is one fund in which you are perhaps especially interested, which is labelled the Proprietors' Fund. That fund, which consists of the undistributed balance of accretion to capital arising through the liquidation of our German Stations, still exists and may at any time be distributed to the Proprietors should our circumstances permit of its being treated in this manner. Some of you may think that the moment for the distribution of that fund is overdue, but what could be the advantage to you in distributing it when the Association is faced with the necessity of calling up fresh capital to enable it to finance its programme of development?

General Amortization Account, like the others, continues its independent existence, and this year receives a quota of £51,000. As I explained to you when dealing with the Profit and Loss Account, any further large appropriations will tend to become unnecessary.

Some of you may wonder why, as each reserve continues its separate existence in our books, the accounts before you show a composite total for all the reserves. When the excitement in regard to our Stock was at its height, the Office received many visits from Stockholders, who were anxious to know which of the Reserves shown in our 1927 Accounts were true reserves—a not unnatural question. Having received the necessary information they proceeded to total up the true reserves. In the new Accounts we have endeavoured to give you this information at first glance by transferring to Sundry Creditors the reserves for Pensions and Taxation, which were not free, and by giving under General and Specific Reserves the simple total of the true reserves. The name assigned to each reserve is evidence of the Board's intention as to its ultimate application, but in case of an emergency, of whatever character, all these reserves would be available to meet it. As there can be no guarantee that the application of each separate reserve will be confined to the object for which it was created, we think it better to group them rather than to set them out item by item. We hope that by so doing we shall remove a possible cause of misapprehension, and that you will be better able to appreciate the extent of our reserves in relation to the capital and other true liabilities.

The balancing item of Profit and Loss is £428,466 3s. 5d., after providing for the payment of the Interim Dividend at the rate of 5 p.ct, which you received in November last. The policy of appropriation which we now recommend for your acceptance is the allocation to General and Specific Reserves of £70,000; the payment of a final dividend on the Capital Stock of 10 p.ct., *less* Income Tax, making 15 p.ct. for the year, amounting to £158,080; and a profit participating bonus to the Staff of £2371. This will leave a balance to be carried forward to our next account of £198,000, or an increase of £78,000.

The only item in these proposals which calls for comment is the allocation of a participating bonus to our London Staff, which is a new feature in our accounts. Your Board must take the blame for this, but we feel that we owe a great deal to our Staff, and that it would be in accordance with your wishes that they should receive

some acknowledgment for their services. The scheme, which we propose, is that they should receive each year, for division among them, a sum equivalent to 1 p.ct. of the net amount distributed as dividend. If we had so desired, we could have voted this appropriation without coming to you, but I think that you will deem it a privilege to vote this sum yourselves as a mark of your appreciation.

I think I have dealt with every item in the Accounts except one, and that is the Auditors' Certificate and the signatures which appear at the foot of it. The signatures of these two gentlemen appear for the last time, as, in order to enable professional accountants to be appointed as Auditors, they have both taken the public-spirited step of abstaining from offering themselves for re-election.

Mr. Bassett has been an Auditor since 1909, while his family have been associated with us for many years, as his grandfather and his uncle were both Directors of the Company.

Mr. Marshall has been Auditor since 1913, and has also family links with the Association.

I think you will all agree with me in thanking these two gentlemen for the able and devoted manner in which they have filled the office of Auditor for so many years, and acknowledged that the consideration which has led them to resign office is one which does them very great honour. I know that these two gentlemen have watched zealously over your interests; and the Board, in taking farewell of them, will do so with very real feelings of regret. Should it meet with your approval, we propose to offer our retiring Auditors five hundred guineas each, to mark the appreciation of our Association for their services, and to enable them to visit the Stations they have so often read about but perhaps never seen.

There is one point with which I feel it my duty to deal before terminating my remarks, but about which I would willingly say nothing, because there is nothing that I can say that can be of any possible use to you. I refer to the price of our Stock, and also to any intelligent forecast I can form as to its future. When such a vital and delicate question is approached, there are certain Boards who seem to consider it their duty to wrap themselves up in an augur-like mystery, and to assume pontifical airs, exasperating to their hearers, and, in my opinion, quite unjustified. I think it the duty of this Board to give the most accurate information and the best advice to its Proprietors on all subjects connected with the Association, so long as this does not act in a manner detrimental to the general interests of the undertaking.

Now what is the actual situation? Since last autumn the price of our Stock has risen from about 170 to as high as 490, although its present day value is 450. Is there any explanation for this? I fear that an advantageous sale of a public utility company in France, which had nothing to do with us, was largely responsible for the rise, it being well known that we are interested in prosperous public utility companies in that country. I say I fear because that intelligent anticipation, the main characteristic of the rise, is based on what may be called a break-up value view. Now I do not think that it is our intention to terminate the existence of this Association, and break-up values only come into action when you realize your assets. Another reason for the rise is without doubt because our Stock is tightly held by a body of some six thousand holders. Many of them, like myself, have inherited their holdings, and do not intend to part with them unless they are adequately remunerated for so doing. Therefore there are more buyers than sellers in the market, and the inevitable consequence follows as soon as any substantial bid is made for our Stock. It may surprise some of you to learn that, despite the large volume of dealings in our Stock, over 77 p.ct. of the holders who were on our books when the Stock stood around about 170, figure there still.

The explanation which I have given may appear to be trite and jejune, but it is the only one I know, and I give it to you for what it is worth. You may, however, be quite certain of one thing; you have a valuable property and one which at present is certainly not decreasing in capital value, and also seems to have a fair chance of an increasing earning capacity, so long as your business is conducted with skill and diligence. That it will be the earnest endeavour of your Board to valorize your undertaking, you can be quite certain, but we have by no means an easy task to accomplish, so we therefore ask for your encouragement and sympathy, whilst you on your side of the table may be sure that our efforts will ever be directed towards furthering the prosperity of our Association and of its Proprietors.

It is now my duty to move:—

> That the Report and Accounts, which have been submitted, be received and adopted and a copy inserted in the Minutes.

[Loud applause.]

THE RIGHT HON. SIR GUY D. A. FLEETWOOD WILSON, G.C.I.E., K.C.B., K.C.M.G.: I have pleasure in seconding that.

A PROPRIETOR: With regard to the bonus to the Staff. Does that include both the Continent and London?

THE CHAIRMAN: No, only London.

MR. CLARK: I should like to refer to the question of the Association being wound up. I do not think that this question had very much to do with the rise in the price of the stock. The Stockholders were, of course, aware that we have a very large holding in the Compagnie Continentale, and inasmuch as that holding is quoted on the Paris Bourse, it is quite possible for anybody, by multiplying our holding, to arrive at its value. Our holding is such a large percentage of the whole—I believe 86 p.ct.—that very little buying would have an abnormal effect on the price of the stock. At the same time, I think the Shareholders might rightly wish advantage to be taken of this enormous appreciation of our holding, if it can be realized. We are in part a Trust Company, and surely a Trust Company buys its holdings for appreciation. The interest we receive from this French holding has no relation to its value; the return is very small. If you could sell this at anything like the present price, and invest the money in War Loan, the income would be enormously increased, and the present price of the stock would be justified. This Association is an enormously prosperous one. It is admirably managed, and you have told us to-day in your very able and exhaustive speech a great deal that we wished to know. At the same time, I had the honour of meeting you at another Gas Company's meeting, and at that time the price of Continental Union Stock was 39, and I asked whether it was not probable that the price of the stock on the liquidation of the French assets would be 75. You said it would be a pity if the shareholders went away with such a misguided notion. Within a few months the price of that stock was 120.

MRS. MARY PHILLIPS: I am a member of a third generation of stockholders. You have referred to walking slowly. During the war, as far as we were concerned, the Association stood still, and after the war we had a certain amount of capital returned at par. Now to-day you say many of us are original holders, and if there was a possibility of a distribution of capital it would mean something to those who had money returned at par after the war and had nothing at all during the war.

MR. MORRIS: Can you give in the next balance-sheet a list of the Association's holdings? As it is now going to be a Holding Company, there can be no possible objection to the shareholders knowing what their holdings comprise. It will not convey anything to your competitors, and cannot be against the interests of the Association. The Proprietors would appreciate such a step. They would then be able to form in their own minds some idea of the value of their shares.

THE CHAIRMAN: As no other Proprietor wishes to speak, I will deal with the points that have been raised. I must thank Mr. Clark for his extremely just and moderate remarks, and I am bound to say I entirely agree. It is, however, of course, an extraordinarily delicate question, and one which I think it would be very much better for us not to thresh out here. But you can be perfectly certain that your Directors are fully alive to all the considerations that you put before us, and that should we see any opportunity of bettering your position, we shall be the last people to miss taking advantage of it. Mrs. Phillips asked about distributing capital. In the first place, I think she is ungrateful, because after the war we restored blocks of money of which you had been deprived during the war. All the profits which were supposed to have been made during the war were restored, so that she did not lose in the long run. But I must ask her to consider this: We are an expanding Company, very much in want of money. We are very poor in our treasury [Laughter], and we are coming to you *in forma pauperis* for more money. Now she proposes that we should distribute money among you. I really cannot see the exact sense of that. If she will stay her hand a bit, she may perhaps have money returned, as and when we get it; but we have not got it at present. Mr. Morris raised an important point, and one which I am glad he mentioned, because I should like it threshed out. He suggests that, as we are now a Holding Company, our list of investments should be published. Well, if we were merely a Trust Company, I think there might be a great deal to be said for that point of view; but unfortunately we have all sorts of delicate negotiations on the Continent, of which necessarily the Proprietors are in complete ignorance. These involve very often the purchase of shares in undertakings secretly, in order to acquire control; and it would be most undesirable to let the public know anything of these matters. ["Hear, hear."] Though I quite sympathize with Mr. Morris's point of view, I am afraid I should resist it with all my power. Nothing would induce me to give way. Any Proprietor who likes to come along to the office and inquire as to what our holdings in particular undertakings may be, may rest assured that we shall be only too delighted to give him such information as we are able to without detriment to the interests of the Association.

MR. MORRIS: That would meet the case, Sir.

THE CHAIRMAN: I will now put the resolution for the adoption of the report and accounts. It is carried unanimously. The next resolution is:

> "That, upon the holdings of capital stock as registered in the books of the Association on May 29, 1929, there be paid on June 18, 1929, less Income-Tax at 4s. in the £, a Final Ordinary Dividend for the year ended Dec. 31, 1928, at the rate of 10 p.ct. (actual), making with the Interim Dividend of 5 p.ct. (actual) paid in November, 1928, a Dividend of 15 p.ct. for the year."

SIR GUY FLEETWOOD WILSON seconded the motion, which was unanimously agreed to.

THE CHAIRMAN: The next motion is:

> "That the Authorized Capital be increased to £3,000,000 by the creation of £1,024,000 of new Capital Stock."

SIR GEORGE JESSEL, Bart., M.C., seconded the proposition, which was agreed to.

THE CHAIRMAN: The next resolution is:

> "That Sir Henry Birchenough, Bart., K.C.M.G., Sir George Jessel, Bart., M.C., and Mr. S. H. Le Roy-Lewis be re-elected Directors of the Association."

Mr. H. G. PALMER seconded the resolution, which was passed.

MR. LLOYD: I beg to propose that Messrs. George A. Touche and Company, of Basildon House, Moorgate, E.C. 2, be elected Auditors of the Association. The remuneration, I suggest, should be left to the Board. I should also like to express, on behalf of the Proprietors, our appreciation of the services of the gentlemen who have retired from the office of Auditor, and our cordial support of all the remarks you have made in regard to that circumstance. ["Hear, hear."]

MR. G. G. HAY seconded.

THE CHAIRMAN: The amount of remuneration has to be voted. I think the arrangement is 250 guineas per annum.

MR. LLOYD: I will add that they be appointed at a remuneration of 250 guineas per annum.

This was agreed to.

THE CHAIRMAN: There is one other matter to conclude the proceedings, and that is a vote of thanks to our staff, who have contributed so largely to earn this enormously increased profit, and who work, I can assure you, unremittingly, and never complain when I impose extra burdens upon them.

SIR GUY FLEETWOOD WILSON: I have great pleasure in seconding that.

The vote was cordially passed.

MR. C. F. DENBY MARSHALL, M.A.: On behalf of Mr. Bassett and myself, may I thank you all for your generosity and the kind way in which our services have been acknowledged?

This terminated the proceedings.

MONTEVIDEO GAS AND DRY DOCK COMPANY, LIMITED.

Balance of Ordinary Capital to be Issued.

The Fifty-Seventh Ordinary General Meeting of the Company was held on Tuesday, May 28, at Dashwood House, Old Broad Street, E.C.—Mr. FRANK H. JONES, M.Inst.C.E. (the Chairman), presiding.

The LONDON MANAGER AND SECRETARY (Mr. Henry Kearns) read the notice convening the meeting and the report of the Auditors; and the minutes of the last meeting were taken as read, as also were the report of the Directors and the statement of accounts for the year ended Dec. 31.

The CHAIRMAN: Since our last meeting one of our colleagues has been honoured by His Majesty the King in having a baronetcy conferred upon him; and I am sure that stockholders will wish to share in our congratulations to Sir Edgar Horne. I regret that our former Chairman, Mr. Charles Hunt, who was an outstanding Engineer in the gas world, and who retired from the Company in 1926, has recently died; and I should now like to put on record our appreciation of his services.

On turning to the balance-sheet, you will see that we have spent on capital account £22,481. Our total capital expenditure during the last nine years amounts to no less than £198,990; and that the money has been well spent, and is revenue producing, is, I think, proved by the excellent results we are able to place before you to-day. The tonnage of coal in stock at Dec. 31 was considerably higher than in the previous year, and its average cost is favourable. The total of the sundry debtors is arrived at after deducting bad debts, so that the outstanding accounts may be considered as all recoverable. The item also includes taxes paid in advance in Montevideo. Our investments show an increase of £5069, and amount to £55,663, which is below their market value on Dec. 31 last; and our cash in London and Montevideo shows an increase of £7781. On the debit side, sundry creditors show an increase of £7101; but this includes the heavy sum we have set aside to meet the Absentee Landlords' Tax to the end of the year under review. If you will refer to the revenue account, I think you will consider it a satisfactory achievement that we have been able to increase our receipts by £14,985, while at the same time reducing our expenditure by £4830. The expenditure includes £10,026 written-off for depreciation, and a considerable sum to meet the Absentee Landlords' Tax. You will therefore see that our economies have been considerable, to produce a net result giving us £19,819 more revenue than in the previous year.

GROWING GAS SALES.

There has been a satisfactory increase in the number of consumers, and our sales of gas show an advance of 8·82 p.ct., thus maintaining the record of increases commencing with the year 1918, and aggregating practically 100 p.ct. The only unsatisfactory feature we have to record is the large reduction in the receipts from residuals. Coke has been a very bad market; and we lost more on residuals than we saved on coal. The burden of taxation weighs heavily upon us; and the Absentee Landlords' Tax, which I have previously mentioned, has had to be paid this year. We were exempted by Government decree from the payment of this tax; but the Courts decided not only that the tax has to be paid by us from 1916-17, but we have been fined 40 p.ct. for non-payment, as though we had fraudulently evaded it. We employ a large number of men in Montevideo, and they and their families are dependent upon the Company; and I doubt whether there is another Montevidean absentee landlord who spends more on local materials, in wages, customs duties, and taxes than we do. However, in anticipation of this liability, we have over the series of years provided for the whole sum up to Dec. 31, 1928, so the heavy payment we have to make will not fall as a charge against the profits of the current year, although we shall have to provide annually for this additional tax.

We have been in negotiation with the authorities regarding the south coast embankment scheme. This will involve the removal of our largest gasholder, which was completed as recently as 1926, and for which the Municipality granted us a permit to erect it on the present site. The new road cuts through our property, and thanks to the negotiations of one of your Directors, Mr. Mallet, who visited Montevideo, and to our General Manager, we have arrived at an amicable arrangement with the authorities by which they give us an amount in cash as compensation for removal, and a new site which adjoins our present works, but which is smaller in area than the land to be taken in exchange. This is much to be regretted, bearing in mind the extension of our works which must become necessary in the future to maintain our indispensable service to the public.

TERMS OF THE NEW ISSUE.

Needless to say, this arrangement will involve the Company in considerable financial sacrifice. Before we can remove Holder No. 5, we must erect a new holder to maintain our supply to the city; and this money must be expended at once—years before it would otherwise have been necessary. To meet this expenditure, and for further mains, meters, and cookers, and also because our capital account is already overspent by £38,000, we propose to issue at par to the stockholders the balance of the ordinary capital in the proportion of £1 to £10 held; and as our stock is quoted 107½ to 108¼, we have no doubt that the amount will be readily taken up. Full provision has been made for the yearly redemption of the 6 p.ct. debenture stock, and we have transferred £5000 to reserve account, and £2000 to the pension fund, which, in view of this year's good results, we feel sure will meet with your approval. We had hoped that our General Manager, Mr. Whyte, would have been present to-day; but unfortunately he was not able to sail from Montevideo before May 24. His presence in this country will be of benefit to the Company, as it is desirable that we should fully discuss with him our policy and our proposals as to new manufacturing plant to meet the requirements of our growing business.

AN INCREASED DIVIDEND.

It is with pleasure that we are able to increase the dividend by 1 p.ct.; and I now beg to move:

> "That the report and accounts now presented be received and adopted, and that a dividend be, and the same is hereby, declared on the ordinary stock of the Company for the half-year ended Dec. 31, 1928, of 4½ p.ct., free of income-tax, payable on May 29, and making with the interim dividend previously paid 7 p.ct., free of income-tax, for the year 1928."

Sir EDGAR HORNE, Bart., seconded the resolution, which was carried unanimously.

The retiring Director (Mr. E. Bruce Read) and the Auditors (Sir Laurence Halsey and Mr. William C. Sneath) were re-elected.

The proceedings were brought to a close with hearty votes of thanks to the whole of the staff of the Company and to the Chairman and Directors for their services during the past year.

MERCHANDISE MARKS ACT.

Inquiry Continued.

The Board of Trade Committee heard further evidence in regard to imported illuminating glassware on Monday, May 27, when the inquiry into the application by English glass manufacturers for a Marking Order was resumed in London after the Whitsun holidays.

Mr. *Robert W. Buckingham* said he had been buying and selling all kinds of lighting glassware for over 30 years, his supplies coming chiefly from Germany and Czecho-Slovakia. In doing so he had not been influenced by questions of price, but had been compelled to go abroad because the foreign manufacturers had cultivated this trade, had made special designs for the particular purpose, and had created designs to suit the market here. The standard sizes of lighting glassware sold in this country were only used in Great Britain and Australia, and, as no other countries in the world used these sizes, everything had to be made specially by the foreign makers for this market. He alleged that 95 p.ct. of the volume of the decorative lighting glassware used here in the form of globes, bowls, and chimneys was foreign for the reason that the British makers could not meet the demand. In value, 90 p.ct. of this class of glassware for foreign. No English glass was made in quantity to suit the requirements of this country, though a certain amount was produced.

Witness, answering the Chairman, said the glassware which he imported did not bear any mark, except in special cases where the seller in this country required his own distinguishing mark. As regards the cost of marking imported glassware, Mr. Buckingham said he had been informed by one of his manufacturers that this would cost an extra 3s. per gross in the case of clear optic balloons

and opal and flint balloons, and he anticipated that the consumer would have to pay at least 12½ p.ct. extra on account of the cost of marking. According to the quality of the article, he estimated, from what he had been told by his manufacturers, that the extra cost due to marking would vary between 6 p.ct. and 12½ p.ct. In reference to the glass which was used by fittings manufacturers in this country, he expressed the opinion that to mark this would give the impression that the whole fitting was foreign, and this would have a serious effect upon the trade of the fittings manufacturers in Birmingham and London, who, in respect of gas and electric fittings, hold preference throughout the world. In all cases the cost of the glass was very much less than the cost of the metal work, which foreign firms could not make anything like as good as the British makers.

Witness, answering Mr. Barnes (a member of the Committee), said that in some cases the cost of the glass portion of a lighting fitting would be increased by 100 p.ct. if they were marked.

Mr. Wethered, in his cross-examination, suggested that the firms from whom witness bought on the Continent were aware of this inquiry when they made their quotations as to marking, and had put their figures on the high side for that reason.

Mr. *Buckingham* would not agree; and added that similar figures to those he had mentioned had been quoted him on previous occasions when he had wanted some special mark put on some particular goods.

Mr. Hailwood, of Messrs. Hailwood & Ackroyd, Ltd., also questioned Mr. Buckingham, and said he knew by experience that the cost of marking such things as miners' lamp glasses was only 1½d. per 100.

Witness inspected the glass, and expressed the opinion that it was quite good. He was also surprised that it could be marked in the way it had been so cheaply.

Answering other questions, Mr. Buckingham said the Birmingham fittings manufacturers objected to any mark being upon the glass which they used in their fittings. He agreed with Mr. Hailwood that he had not written to Messrs. Hailwood & Ackroyd to ascertain what they were prepared to make in the way of illuminating glassware, and gave as the reason that many of the designs in Messrs. Hailwood & Ackroyd's catalogue were copies of those which he had been importing from the Continent for many years.

Mr. Barnes pointed out that, though it had been said that English makers did not make illuminating glassware, they actually exported last year to the value of £41,000.

The Chairman remarked that the Board of Trade figures showed imports of glassware amounting to £300,000, and exports of English glassware to the value of over £40,000.

Mr. *Buckingham* said there was a very big margin which the home manufacturer did not cover.

The Chairman: Your natural inference is that the British makers are making practically solely for the export market.

Mr. *Buckingham*: Yes.

Mr. Barnes said the figures of exports conveyed to his mind that the British makers could meet the home demand.

Mr. *Buckingham* replied that the home demand was very much greater than £41,000.

Mr. Hailwood said that his firm did not charge extra for marking, as they found the cost so extremely small.

The Chairman, speaking of the suggested difficulty of marking stocks, remarked that it would only have to be done once if an Order were made.

Wednesday, May 29.

The inquiry was concluded on May 29.

Mr. N. L. Macaskie, addressing the Committee on behalf of the opponents, said that, although the applicants asked for an Importation Order, no evidence justifying the application had been given, and no attempt had been made to deal with the difficulties which would be encountered by the Customs Authorities, owing to a very careful examination that would have to be made to ascertain that the glassware coming into the country had been properly marked. Referring to imported illuminating glassware, Counsel impressed upon the Committee that there was an extensive industry in this country in mounting glass for many purposes, including lighting installations and fittings, and it was clear that this industry would be seriously handicapped if the glass which it used had to be marked as being of foreign origin. This glass formed but a small proportion of the total cost of the completed article, 90 p.ct. of the total cost in many cases consisting of English labour and materials. Counsel reminded the Committee that in the case of a recent pottery inquiry, the Committee expressly exempted mounting china from the operation of the Order that was then recommended, on the ground that a substantial home industry would be injured by marking the imported china used for mounting purposes. Therefore, the opposition made the suggestion that, as regards illuminating glassware, an Order should not be recommended, because of the injury that would be done to a substantial home industry. If, however, the Committee in its wisdom saw fit to recommend an Order, then the opposition asked that the marking should be by means of labels, as that was the most practicable method, though it would involve inconvenience and expense. As regards marking stocks already in the country, Mr. Macaskie asked that if an Order were recommended, a considerable interval of time—(say) 6 to 9 months—should be allowed to elapse before the Order came into operation, so that existing stocks might be cleared.

Mr. Wethered, replying for the applicants, said the only reason why those in this country who used foreign glass for lighting fittings and similar purposes did not wish to have it marked was that they did not desire to disclose to their customers that they were using foreign glass.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The past week has been remarkable for the continued demand, on a quite unusual scale, for all classes of Durham coals. All available quantities are being eagerly taken up, and the position is now very strong for the whole of June. Quite exceptional for the time of year is the rush for gas coals, which are being sold for several months ahead at the current high figures both on home and export account. Coking remains as firm as ever, and bunker sorts, especially best qualities, are in excellent demand. The position in Northumberland, while not so strong as in Durham, is fairly good, though second qualities can do with more trade.

Wear Special gas is firmly quoted at 17s. 6d. f.o.b., with practically no coal available for weeks ahead. Best qualities are asking 16s. 6d. to 17s., and seconds 16s. to 16s. 6d. Coking is quoted at 16s. 6d. to 17s. Best unscreened steam makes ask 17s. to 17s. 6d., and seconds 16s. to 16s. 6d. Best Northumberland screened steams are 14s. 9d. to 15s. Gas coke is fairly easy for prompt, but firmer at 21s. 6d. f.o.b. for shipment in the second half of the year.

Owing to the heavily sold condition of the Durham market, there appears every chance that prices will be maintained at a good level for the remainder of the year. In discussing business for next year, collieries are already bearing in mind the possibility of altered wage conditions.

YORKSHIRE AND LANCASHIRE.

There is little change in the position, although collieries have largely resumed work. The increased supplies appear to be equal to the demand, which has not shown the expected activity on export account. Values remain at 16s. 6d. per ton f.o.b. for best hards. The demand for furnace coke is subdued, and remains at 20s. per ton f.o.b. Merchants generally report the domestic coal demand quiet. There is an increased supply for coke-making slacks. Gas coal and rough slacks supplies seem equal to the demand. There is not so much forward inquiry, as buyers appear to be waiting to see if there is a further reduction in prices.

The following are the Humber bunker and export prices f.o.b. usual shipping ports:

South Yorkshire—Hards, Association, bunkers 19s. 9d. to 20s. 3d., export 16s. 6d.; screened gas coal, export 16s. 9d. to 17s. 3d.; washed trebles, export 16s. to 16s. 6d.; washed doubles, bunkers 19s., export 15s. 9d. to 16s.; washed singles, export 14s. 9d. to 15s.; washed smalls, bunkers 15s. 9d. to 16s. 3d., export 13s. 6d.; rough slack, bunkers 13s. 6d. to 13s. 9d., export 11s. to 11s. 6d.; smithy peas, export 17s. to 18s.

West Yorkshire—Hartley's (f.o.b. Goole), bunkers 17s. 6d., export 15s. 6d. to 16s.; screened gas coal, export 16s. 9d. to 17s.; washed trebles, export 15s. 6d. to 16s.; washed doubles, export 15s.; washed singles, export 14s. 6d.; washed smalls, bunkers 15s. 3d., export 12s. 6d.; unwashed trebles, export 15s. 6d. to 16s.; unwashed doubles, export 13s. 6d. to 13s. 9d.; rough slack, bunkers 13s. 6d., export 10s.; coking smalls, export 10s.

Derbyshire and Nottinghamshire—Top hards, bunkers 19s. 9d. to 20s. 3d., export 16s. to 17s.; cobbles, bunkers 18s. 9d. to 19s. 3d., export 15s. to 16s.; washed trebles, export 15s. 6d. to 16s.; washed doubles, export 15s. to 15s. 3d.; washed singles, export 14s. 3d. to 14s. 9d.; washed smalls, bunkers 15s. 3d. to 15s. 9d., export 12s. 6d. to 13s.; unwashed doubles, export 14s. to 14s. 6d.; rough slack, bunkers 13s. 3d. to 13s. 9d., export 10s. to 10s. 6d.

Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, bunkers 17s. to 18s., export 15s. to 16s.; gas coke, export 19s. 6d. to 21s. 6d.; furnace coke, export 20s. to 21s.; washed steams, Goole (West Yorkshire), bunkers 18s.; Hull (West Yorkshire), 18s. 6d; Hull (South Yorkshire), bunkers 18s. 9d., export 16s. per ton.

MIDLANDS.

A few gas undertakings have yet to complete their contracts for the next year, but the main tonnage has now been arranged. Works managements who are in a position to drive a hard bargain have secured supplies at 6d. a ton advance on the prices agreed a year ago. More generally probably collieries have been able to get an advance of 1s.

There is very little business passing in household coal. The market for industrial grades continues featureless. Stocks have been increasing at some of the collieries. There is no serious unbalancing, however, and now that members of the Five Counties organization have received their new quota many pits are finding more employment for the time being.

Though a proportion of the coke supply which was graded for domestic consumption during the cold weather is now available for use in the blast-furnaces, there is no superfluity.

The shrinkage in the output of coking slacks involves some stringency, and at coking ovens allied with collieries supplies are being augmented from outside sources, about 9s. per ton, delivered, being offered. Furnace coke remains at 14s. 6d. to 14s. 9d. at ovens.

Accrington Gas Profits.—At a meeting of the Accrington District Gas Board, on May 30, the Gas Manager said the gross profit on gas was £39,417. Price reductions equal to £9300 had been made, and the distribution costs were estimated at £3000 over what they would have been under normal conditions. After meeting £17,192 for interest charges, £10,683 for contributions to sinking funds, and £6529 for income-tax, there was a net profit of £4739, increasing reserve to £8270.

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends, Prev. Hf.Yr	Dividends, Last Hf. Yr.	NAME.	Quotations. May 31.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Feb. 7	5	5	Aldershot 5 p.c. max. C.	70—75	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	72—75	..	..
1,581,868	,,	Apl. 11	7⅞	7⅞	Alliance & Dublin Ord.	96—99	..	97½—98
274,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	64—67	..	..
522,655	,,	Mar. 7	7	7	Barnet Ord. 7 p.c.	114—117	..	116½
300,000	,, 1	May 9	1/4⅛	1/4⅛	Bombay, Ltd.	20/—22/-	..	..
172,500	10	Mar. 7	8½	9	Bournemouth 5 p.c.	13—13½	..	..
500,000	10	,,	7	7	Do. B 7 p.c.	12⅞—13¼	..	..
439,160	10	,,	6	6	Do. Pref. 6 p.c.	10¾—11¼	..	..
50,000	Stk.	Jan. 10	3	3	Do. 5 p.c. Deb.	55—58	..	56—56½
162,925	,,	,,	4	4	Do. 4 p.c. Deb.	74—77	..	..
867,900	,,	Mar. 21	7½	7½	Brighton & Hove 6 p.c. Con.	113—116	..	114½—115½
371,880	,,	,,	6⅔	6⅔	Do. 5 p.c. Con.	99—102	..	..
1,327,500	,,	Feb. 21	5	5	Bristol 5 p.c. max.	21—22a	+½	..
885,000	,,	Apl. 11	8	7½	British Ord.	116—119	..	118
100,000	,,	Dec. 20	7	7	Do. 7 p.c. Pref.	115—120	..	..
100,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	73—76	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	94—97	..	96—96½
180,000	10	May 30	6	8	Cape Town, Ltd.	7⅞—8⅜*	—¼	..
160,000	10	Apl. 24	4½	4½	Do. 4½ p.c. Pref.	6½—7½	..	6⅞
150,000	Stk.	Dec. 20	4½	4½	Do. 4½ p.c. Deb.	75—78	..	..
696,860	,,	Feb. 21	6	6	Cardiff Con. Ord.	97—100	..	..
327,860	,,	Jan. 10	7½	7½	Do. 7½ p.c. Red. Deb.	101—104	..	..
167,150	,,	Feb. 21	5	6¼	Chester 5 p.c. Ord.	88—93b	..	..
26,936	1	May 9	1/2/-	1/2/-	Colombo Ltd. Ord.	35/—37/-	..	..
24,495	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	20/—22/-	..	..
275,402	1	Apl. 11	1/9⅜	1/9⅜	Colonial Gas Assn. Ld. Ord.	24/6—26/6	..	..
167,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/6—22/6	..	..
2,078,280	Stk.	Feb. 21	5	7	Commercial Ord.	97—100	..	98—98½
475,000	,,	Dec. 20	3	3	Do 3 p.c. Deb.	56—59	..	56½
660,000	,,	May 9	‡1	§2⅔	Continental Union, Ltd.	128—128	—2	124½—127½
300,000	,,	,,	7	7	Do. 7 p.c. Pref.	124—127*	..	..
187,550	,,	Feb. 21	7	7	Croydon sliding scale	111—114	..	..
409,100	,,	,,	5	5	Do. max. div.	83—86	..	..
542,270	,,	Mar. 7	7	10	Derby Con.	112—117e	..	..
55,000	,,	Dec. 20	4	4	Do. Deb.	70—72e	..	..
369,000	,,	Mar. 7	5	5	East Hull Ord. 5 p.c.	73—75	..	..
1,022,180	10	Mar. 21	†4	†7	European, Ltd.	16½—18½	..	16¾—17½
13,705,480	Stk.	Feb. 21	5½	5⅔	Gas Light & Coke 4 p.c. Ord.	19/3—19/9f	..	19/3—19/7½
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max.	63—65	..	63¼—64½
4,187,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	76—78	..	76—77½
5,609,620	,,	Dec. 20	3	3	Do. 3 p.c. Con. Deb.	59—62	..	59½—62
2,643,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	98—101	..	100⅔—101
99,500	,,	Mar. 21	7	7	Hastings & St L. 5 p.c. Con.	98—103	..	..
258,740	,,	,,	5½	5½	Do. 5½ p.c. Conv.	80—85	..	..
70,000	10	Apl. 24	†10	†10	Hongkong & China, Ltd.	14—16	..	..
213,200	Stk.	Mar. 7	5½	6	Hornsey Con. 5½ p.c.	86—89	..	..
1,916,000	,,	May 30	5	10	Imperial Continental Gas.	420—440*	—30	420—470
233,180	,,	Feb. 7	8½	8½	Do. 8½ p.c. Red. Deb.	70—73	..	..
335,242	,,	Mar. 7	7½	8	Lea Bridge 5 p.c. Ord.	117—120	..	..
2,145,807	,,	Feb. 21	6½	6½	Liverpool 5 p.c. Ord.	95—96b	..	..
600,000	,,	Mar. 21	7	7	Do. 7 p.c. Red. Pref.	102—104b	..	..
168,736	,,	Feb. 21	9	8	Maidstone 5 p.c. Cap.	124—129	..	..
63,480	,,	Dec. 20	3	3	Do. 3 p.c. Deb.	54—57	..	..
78,000	5	Dec. 6	18	18	Malta & Mediterranean	5⅞—6⅛	..	..
392,000	—	Apl. 2	—	5½	Metrop't'n (of Melbourne) 5½ p.c. Red. Deb.	100—103	..	..
841,920	Stk.	May 30	†5	†9	Montevideo, Ltd.	102—105*	—5	..
2,051,318	,,	Feb. 21	5	5⅓	Newcastle & Gateshead Con.	16/9—17/6d/	—/3	..
582,856	,,	,,	4	4	Do. 4 p.c. Pref.	74½—75½d	..	..
491,705	,,	Dec. 20	8½	8½	Do. 8½ p.c. Deb.	69½—70½d	..	..
181,780	,,	Mar. 7	7/1/0	7/1/0	North Middlesex 6 p.c. Con.	105—110	..	..
900,000	,,	Apl. 24	9	7	Oriental, Ltd.	115—120	..	..
188,190	,,	Dec. 20	7½	8	Plym'th & Ston'house 5 p.c.	112—115	..	..
424,416	,,	Feb. 21	7⅔	8⅓	Portsm'th Con. Stk. 4 p.c. Std.	113—118	..	..
241,446	,,	,,	5	5	Do. 5 p.c. max.	82—85	..	..
2,334,464	1	—	—	—	Primitiva Ord.	35/—37/-	..	33/6—36/3
244,500	100	Dec. 3	4	4	Do. 4 p.c. Red. Deb.	93—96	..	..
695,000	Stk.	Jan. 24	4	4	Do. 4 p.c. Red. Deb. 1911	79—82	..	..
416,345	,,	Dec. 20	4	4	Do. 4 p.c. Cons. Deb.	79—82	..	..
160,000	10	Mar. 21	6	6	San Paulo 6 p.c. Pref.	8½—9	..	8½
1,736,968	Stk.	Mar. 21	6⅔	6⅔	Sheffield Cons.	109—111e	..	..
95,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	74—77e	..	..
90,000	10	June 14	†3	†4	South African	4—6	..	..
6,809,895	Stk.	Feb. 21	5	7½	South Met. Ord.	104—106	..	104½—105½
500,000	,,	,,	6	6	Do. 5 p.c. Irred. Pf.	108—111	..	..
1,895,445	,,	Jan. 10	3	3	Do. 3 p.c. Deb.	59—61	..	..
784,000	,,	Mar. 7	6½	6½	Do. 6½ p.c. Red. Db.	100—102	..	102
91,800	,,	Mar. 7	8½	8½	South Shields Con.	106½—107½d	..	..
1,543,795	,,	Feb. 21	6½	6½	South Suburban Ord. 5 p.c.	107—110	..	..
468,837	,,	Dec. 20	5	5	Do. 5 p.c. Deb.	97—100	..	..
647,740	,,	Mar. 7	5	5	South'mpton Ord. 5 p.c. max.	77—80	..	..
191,275	,,	Dec. 20	4	4	Do. 4 p.c. Deb.	72—75	..	..
179,014	,,	Feb. 21	8	8	Sutton Ord.	116—119	..	..
250,000	,,	Feb. 21	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
100,000	,,	Dec. 20	6½	6½	Do. 6½ p.c. Red. Deb.	100—102	..	..
1,002,275	,,	Mar. 7	—	6⅔	Tottenham District Ord.	106—109	..	107
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
181,255	,,	Dec. 6	4	4	Do. 4 p.c. Deb.	75—78	..	..
282,094	,,	Mar. 7	6⅔	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	93—98	..	94½
88,880	,,	,,	5	5	Do. 5 p.c. pref.	85—90	..	..
80,000	,,	Feb. 21	8½	9	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	147—152	..	..
355,686	,,	,,	7½	7½	Do. B 8½ p.c.	125—130	..	..
432,685	,,	,,	6⅔	6⅔	Do. C and New	102—107	..	..
362,000	,,	,,	6⅔	7½	Do. Wimbledon 5 p.c.	115—120	..	..
98,000	,,	,,	7⅓	7⅓	Do. Epsom 5 p.c.	126—131	..	130
200,000	,,	,,	5	5	Do. 5 p.c. Pref.	90—95	..	..
88,416	,,	Dec. 20	3	3	Do. 3 p.c. Deb.	56—59	..	..
284,743	,,	,,	4	4	Do. 4 p.c. Deb.	77—80	..	78
297,500	,,	,,	5	5	Do. 5 p.c. Deb.	97—100	..	..

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle. e.—Sheffield. f.—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year.

§ % p.a. for 9 months to March 31, 1929.

"LUX" IS NO LUXURY.

"The Best is Cheapest." This is one of the truest of all maxims; and it applies with great force to the employment of "Lux," which is the best, and in practice the cheapest, of all purifying materials. Its use is increasing rapidly; the sales to-day bear little relationship to those of only a year or two ago. And we know that, as the virtues of "Lux" are more widely appreciated, the present consumption of this nonpareil sulphuretted-hydrogen remover will appear grotesquely small when contrasted with the quantity used in, say, 1930 or 1931.

The advantages to be derived by the employment of "Lux" are both direct and indirect. Regarding the former "Lux" enables the capital sunk in purifying equipment to be better utilized; where other materials have been employed it brings a new lease of life to purifiers, obviating unnecessary extensions of plant; it reduces labour costs to an absolute minimum. Regarding indirect advantages its use makes for more regular control, better and smoother working of the entire gas cleansing plant, and this reflects favourably on the all-important cost of the "therm into the holder."

There is another aspect of "Lux" which must not be forgotten. In addition to removing sulphuretted-hydrogen from gas, it removes hydrocyanic acid, which, as all gas engineers realize, is a most potent cause of internal corrosion of plant in the works and on the district of supply. Thousands of pounds sterling is sunk by the gas industry in underground mains and pipes, in which corrosion and decay go on unseen. Anything which lessens the cost which corrosion entails—and "Lux" does lessen this cost—must be of great benefit.

We should like Gas Engineers to know more about "Lux," for we think it would be to their—and incidentally our—advantage.

THOMAS DUXBURY & CO.,

16, Deansgate, MANCHESTER. Palace Chambers, WESTMINSTER. S.W.1.

TELEGRAMS: DARWINIAN, MANCHESTER.
" PARLONDON.
TELEPHONES: 3268-9 CITY, MANCHESTER.
6501-02 VICTORIA, LONDON.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June* 3.

Pitch maintains its firm tone, and it is reported that 37s. 6d. per ton has now been paid for next season's shipment.

Creosote for export is unchanged at 6¾d. per gallon net, f.o.b.

Pure benzole is 1s. 11d. to 2s. per gallon; pure toluole, 2s. 1d. to 2s. 2d. per gallon; and 95/160 solvent naphtha, 1s. 6d. to 1s. 7d. per gallon.

Pyridine is about 4s. per gallon.

Tar Products in the Provinces.

June 3.

The average prices of gas-works products during the week were: Gas-works tar, 18s. 9d. to 23s. 9d. Pitch—East Coast, 34s. 6d. to 35s. 6d. f.o.b. West Coast—Manchester, 29s. 6d. to 30s.; Liverpool, 31s. 6d. to 32s. 6d.; Clyde, 31s. 6d. to 32s. 6d. Toluole, naked, North, 1s. 7½d. to 1s. 8½d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3¾d. to 1s. 4¼d. Heavy naphtha, North, 1s. to 1s. 0¼d. Creosote, in bulk, North, liquid and salty, 3¼d. to 3¾d.; low gravity, 2¾d. to 2¼d.; Scotland, 3¼d. to 3¾d. Heavy oils, in bulk, North, 5¾d. to 6d. Carbolic acid, 60 p.ct., 2s. to 2s. 0¼d., prompt. Naphthalene, £13 to £15. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.		s. d.	
Crude benzole . . .	1 0	to	1 1	per gallon at works
Motor ,, . . .	1 7	,,	1 8	,, ,, ,,
90 p.ct. ,, . . .	1 9	,,	1 10	,, ,, ,,
Pure ,, . . .	2 0	,,	2 1	,, ,, ,,

TRADE NOTES.

"Simplex" Water Gas Plant.

The Vertical Gas Retort Syndicate, Ltd., of 17, Victoria Street, Westminster, have received an order from the Kennoway and Largo Gas Company, Ltd., for an improved type "Simplex" water gas plant.

"D.B." Stoking Machines.

Messrs. W. J. Jenkins & Co., Ltd., of Retford, Notts., have just installed a "D.B." complete stoking machine at Dumfries, while they have in hand two machines for the Bromley Works of the Gas Light and Coke Company. A "D.B." suspended machine has recently been put in at Hertford, and there are two on order, one being for Tavistock and the other for Alfreton.

Gas Enrichment and Gas Manufacture.

The Phillfuels Company, of Bartlesville, Oklahoma (Subsidiary of Phillips Petroleum Company), have published a brochure (Booklet No. 3), the purpose of which is to show: First, means and methods whereby liquefied petroleum gas products can be utilized in effecting economies in the enrichment and the manufacture of gas; secondly, the economic changes and the recent developments in the petroleum industry which have made it advisable and possible to manufacture products heretofore unavailable in commercial quantities; and thirdly, the relationship existing between the gas industry and the petroleum industry.

"Seco" Electrodes.

The Scholey Construction Company, Ltd., of 137, Victoria Street, S.W. 1, have issued a pamphlet dealing with electric arc welding by means of "Seco" electrodes. These electrodes, state the makers, are the result of long experience in all forms of welding, and are designed to give good results with low current consumption and ease in operation. "Seco" electrodes can be successfully used on either direct or alternating current supply, and on the positive or negative poles. The Company will send free samples upon request.

Dry Gasholders, Ltd.

We learn from Dry Gasholders, Ltd., that their Licensors, Messrs. Aug. Klönne, have received additional orders for tankless gasholders on the Klönne system—one for the Zaandam Gas-Works, Holland, of three-quarters of a million c.ft. capacity, and one for the Dortmund Gas Company of one and three-quarters million c.ft. capacity. It is interesting to note that the first tankless gasholder on the Klönne system was erected for the Dortmund Gas Company; and this new contract thus constitutes a repeat order.

Messrs. Ashmore, Benson, Pease, & Co., Ltd., of Stockton-on-Tees, who are one of the licensed firms of Dry Gasholders, Ltd., have obtained from the York Gas Company an order for a tankless holder of the Klönne type of two million c.ft. capacity.

Manufactured Gas Industry of Canada.—It is stated in the "Gas Journal of Canada" that at the end of 1927 the manufactured gas industry in Canada served a total of 460,000 customers, who purchased nearly 15,000 million c.ft. of gas, representing an increase of 5 p.ct. over the previous year. The total investment in the manufactured gas business in Canada is given as $850,000,000, as compared with slightly less than 3000 million in the United States.

CONTRACTS OPEN.

Coal.

The Belfast Corporation invite tenders for the supply of gas coal. [See advert. on p. 611.]

The Colwyn Bay Urban District Council invite tenders for the supply of gas coal. [See advert. on p. 610.]

The Corporation of Wigan invite tenders for the supply of gas coal. [See advert. on p. 611.]

Main Laying.

The Wellington (Salop) Gas Company invite tenders for the laying of a high-pressure main. [See advert. on p. 610.]

Meters.

The Birkenhead Corporation invite tenders for the supply of gas meters. [See advert. on p. 610.]

Pipes, Specials, &c.

The Birkenhead Corporation invite tenders for the supply of wrought and cast iron pipes, fittings, and specials. [See advert. on p. 610.]

Stores, Tools, and Materials.

The Birkenhead Corporation invite tenders for stores, tools, and materials in connection with their gas works. [See advert. on p. 610.]

Tar and Liquor.

The Loughborough Corporation invite tenders for the purchase of surplus tar and ammoniacal liquor. [See advert. on p. 611.]

Vertical Retort Installation.

The Gas Committee of the Rhyl Urban District Council invite tenders for the supply and erection of a vertical retort installation. [See advert. on p. 611.]

Junkers & Co. (Great Britain) has been registered as a private Company, with a nominal capital of £5000, for the purposes of carrying on a business of plumbers and hot water engineers, and manufacturers of cookers and geysers.

Price Reduction at Deal and Walmer.—The Deal and Walmer Gas Company announce a reduction in the price of gas, at and from the June reading of the meters, of two-fifths of a penny per therm, bringing the price to 10d. per therm, or 3s. 11½d. per 1000 c.ft.

The Whitworth Vale Gas Company.—The final report of the Directors of the Whitworth Vale Gas Company, prior to the winding-up of the Company and its purchase by the Rochdale Corporation, states that there is a disposable balance of £16 8s. 8d., which the Directors recommend should be given to the workmen.

Bingley Gas Profits.—A gross profit of £7089 was reported to the Bingley Urban District Council, on May 27, as a result of the past year's working of the gas undertaking. The net profit was £3072, bringing the reserve fund to £15,284. The make of gas during the year constituted a record in the history of the Department. The Gas Committee did not hold out an immediate prospect of a reduction in prices of gas, in view of the decreased value of tar and bye-products, and the expectation of an increase of 1s. 6d. or 2s. per ton in the price of coal during the next financial year. The report of the Electricity Department showed a net loss of £2106, due largely to reduced sale of electricity for power, which was attributed to the depressed state of industry.

Gas Exhibits at the Newcastle Exhibition.—Among the exhibits on the stand of the Newcastle-upon Tyne and Gateshead Gas Company at the North-East Coast Exhibition are examples of the use of high-pressure gas for irons in laundries, for soldering bolts, for blow pipes, and for other purposes. The gas compressor and the fans for the air blast furnaces are driven on the stand by a small gas engine, and another gas engine with direct coupled generator makes a neat self-contained set which is shown running. Bunsen burners of various sizes and for many uses from fish-frying to glue-pot heating are shown. A large gas boiler of a new type for central heating is also on view. Various heat processes will be demonstrated from time to time on the stand during the period of the Exhibition.

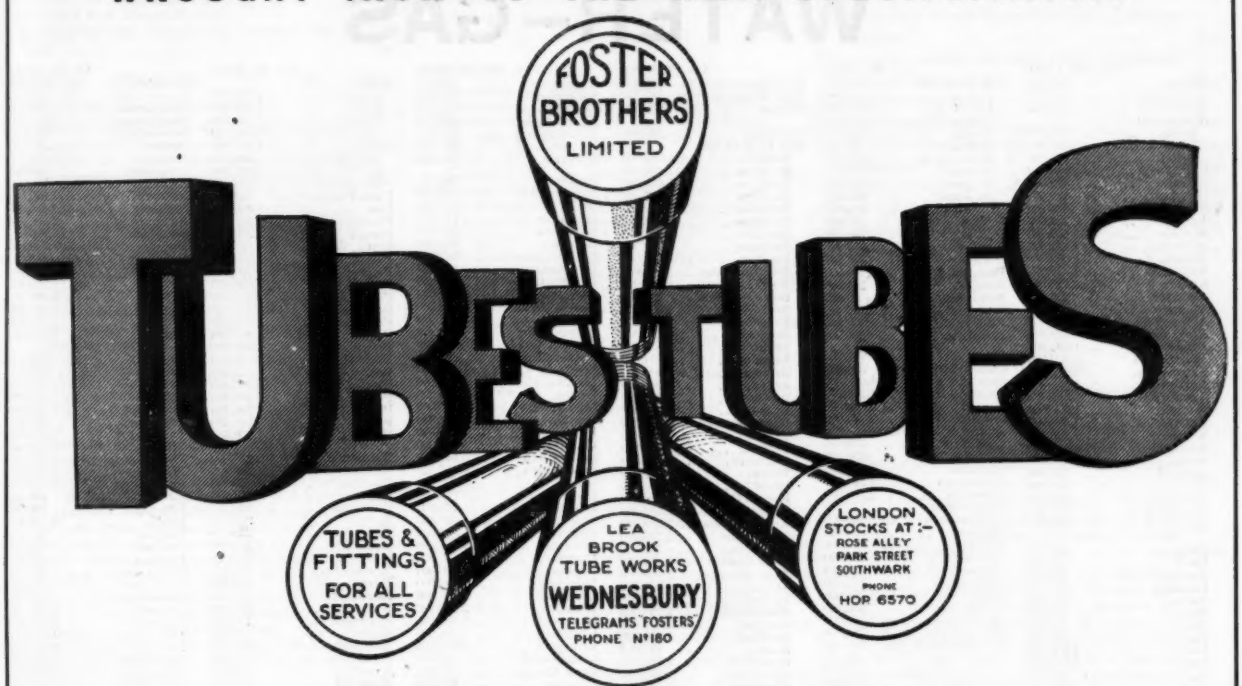
A fine of £2 was imposed at Keighley last week on Alfred B. Ambler, proprietor of a temperance hotel, for fraudulently preventing a gas meter from registering; and he was ordered to pay £3 3s. 10d. for gas consumed.

Of the affiliated companies of the Consolidated Gas Company of New York, the Bronx Gas and Electric Company obtained the greatest percentage of increase in gas sales, or 24·56 p.ct. over 1927. The National Coal and Coke Company—another affiliated Company—sold during last year 61,288 net tons of coke for domestic use, being an increase of 80 p.ct. over the sales of 1927.

A party of about 25 from the Sutton Gas Company, Surrey, paid a visit to the Davis Gas Stove Company's Luton Works, on Wednesday, May 29. A most interesting and instructive day was spent under the guidance of Mr. Harold Davis and his son, Mr. Kenneth Davis. The party included Mr. H. Gage (Engineer and Manager of the Sutton Gas Company), Mr. J. Davis (Outdoor Superintendent), representatives of the Sales Department, fitters, and apprentices.

SPECIALISTS IN:

TUBES & FITTINGS IN GENUINE STAFFORDSHIRE PUDDLED WROUGHT IRON TO THE I.G.E. SPECIFICATION.


FOSTER BROTHERS LIMITED
TUBES
TUBES & FITTINGS FOR ALL SERVICES
LEA BROOK TUBE WORKS
WEDNESBURY
TELEGRAMS FOSTERS PHONE N°180
LONDON STOCKS AT:- ROSE ALLEY PARK STREET SOUTHWARK PHONE HOP 6570

REPRESENTATIVE FOR THE GAS INDUSTRY:

ROBERTSON MURRAY,

32, Victoria Street, Westminster, S.W.1.

Head Office & Works: *WEDNESBURY, STAFFS.*

Telephone: *FRANKLIN 6062.*

IMPROVED TYPE PREPAYMENT METER

fitted with the simplest

TWO COIN ARRANGEMENT

ON THE MARKET

CAN QUICKLY BE CHANGED FROM **1d. to 1/-, or vice versa.**

Price changed "in situ" in a few seconds.
Valve opens at 5 c.ft. without the aid of spring.
Large Cash Box.
Meter cannot be "pumped" for free Gas.

IN "LIGHTS" STANDARD & HIGH CAPACITY

Please send for a Sample

DOUGALL'S GAS METERS Ltd., CHISWICK, W.4

HUMPHREYS & GLASGOW, LTD.

WATER-GAS

	Cu. Ft. Daily
Aarhus	800,000
Abertillery	500,000
Abertillery	100,000
Admiralty:	
British	800,000
British	800,000
British	800,000
British	800,000
British	800,000
French	800,000
French	800,000
Agram	200,000
Airdrie	430,000
Aldershot	1,400,000
Aldershot	1,000,000
Aldershot	1,316,000
Algiers	1,760,000
Alkmaar	400,000
Allenstein	200,000
Alost	700,000
Amersfoort	300,000
Amsterdam	1,000,000
Amsterdam	1,000,000
Amsterdam	2,700,000
Amsterdam	1,350,000
Antwerp	1,500,000
Antwerp	1,000,000
Antwerp	1,500,000
Antwerp	1,900,000
Arundel	215,000
Ascot	423,000
Ashford	250,000
Asnières	650,000
Augsburg	425,000
Aylesbury	150,000
Aylesbury	470,000
Banbury	200,000
Banff	125,000
Barmen	500,000
Barnsley	588,000
Barrow	340,000
Barrow	500,000
Barry	500,000
Barry	720,000
Bath	1,000,000
Bath	1,000,000
Bath	1,300,000
Bath	1,200,000
Belfast	1,700,000
Belfast	4,500,000
Belfast	1,250,000
Belfast	1,250,000
Belfast	2,250,000
Benrath	125,000
Berkhampstead	259,000
Berlin:	
Charlottenb'g	2,500,000
Danziger Str.	1,630,000
Neukoelin	650,000
Neukoelin	700,000
Schmargendorf	760,000
Tegel	3,500,000
Tegel	6,350,000
Tegel	245,000
Berne, Switz.	725,000
Bexhill	400,000
Bideford	258,000
Bilston	375,000
Bilston	125,000
Birmingham:	
Adderley St.	675,000
Nechells	3,000,000
Nechells	3,000,000
Nechells	3,000,000
Swan Village	1,500,000
Windsor St.	3,000,000
Windsor St.	3,000,000
Bishop's Stortford	200,000
Bishop's Stortford	300,000
Bishop's Stortford	200,000
Blackburn	1,190,000
Blantyre	150,000
Blois	125,000
Blois	125,000
Bochum	530,000
Bognor	100,000
Bognor	423,000
Bognor	500,000
Bo ness	125,000
Boulogne	340,000
Bournemouth	1,000,000
Bournemouth	500,000
Bournemouth	1,500,000
Bournemouth	1,000,000
Bournemouth	500,000
Bournemouth	1,530,000
Bournemouth	2,000,000
Bournemouth	500,000
Bournemouth	2,750,000
Bremen	550,000
Bremen	950,000
Bremen	850,000
Brentwood	250,000
Brescia	588,000
Brescia	588,000
Brest	550,000
Bridgwater	200,000
Bridlington	150,000
Bridlington	200,000
Bridlington	550,000
Brieg	100,000
Brierley Hill	250,000
Brighton	1,750,000
Brighton	1,850,000
Brighton	750,000
Brighton	2,750,000
Brighton	3,000,000
Bristol	2,000,000
Bristol	2,500,000
Bristol	825,000
Bristol	825,000
Bromley	1,500,000
Bruges	200,000
Bruges	600,000
Brussels:	
Anderlecht	350,000
Anderlecht	350,000
Forest	1,000,000
Forest	1,000,000
Forest	1,000,000
Forest	1,500,000
Forest	88,000
Koekelberg	1,000,000
St. Gilles	1,000,000
St. Josse	1,000,000
St. Josse	600,000
St. Josse	775,000
Ville	750,000
Ville	750,000
Ville	1,500,000
Ville	350,000
Bucarest	1,100,000
Buckie	164,000
Budapest	50,000
Budapest	1,750,000
Budapest	200,000
Budapest	250,000
Caen	250,000
Cambridge	500,000
Cambridge	1,000,000
Cambridge	1,700,000
Cardiff	2,000,000
Cardiff	3,000,000
Cardiff	1,350,000
Cardiff	600,000
Carlisle	600,000
Carlsruhe	500,000
Carnarvon	248,000
Charleroi	1,250,000
Châteauroux	125,000
Châteauroux	125,000
Châtelet	500,000
Chester	564,000
Chesterfield	430,000
Chesterfield	90,000
Chesterton	197,000
Chichester	250,000
Chorley	300,000
Cie. des Compteurs	1,150,000
Cie. Lorraine de Ch.	210,000
Cie. Mines de Roche	585,000
Coatbridge	400,000
Commercial, L'n	850,000
Commercial	850,000
Commercial	1,250,000
Commercial	2,000,000
Commercial	800,000
Commercial	2,100,000
Copenhagen	700,000
Copenhagen	2,500,000
Copenhagen	1,750,000
Copenhagen	1,200,000
Courtrai	250,000
Coventry	600,000
Coventry	600,000
Coventry	800,000
Coventry	1,250,000
Coventry	350,000
Cowdenbeath	420,000
Cracow	200,000
Cracow	200,000
Cranleigh	188,000
Crefeld	500,000
Crewe	700,000
Crewe	800,000
Crosfield & Sons	1,500,000
Crosfield & Sons	1,500,000
Crowborough	150,000
Croydon	1,250,000
Croydon	625,000
Croydon	625,000
Croydon	550,000
Croydon	650,000
Croydon	1,125,000
Croydon	150,000
Croydon	3,000,000
Croydon	6,000,000
Deal	250,000
Deal	250,000
Debreczin	100,000
Derby	1,500,000
Derby	2,000,000
Deventer	150,000
Deventer	200,000
Devonport	1,600,000
Devonport	1,100,000
Doncaster	1,350,000
Dorking	150,000
Dorking	300,000
Dorking	130,000
Dover	500,000
Dublin	2,000,000
Dublin	2,000,000
Dublin	650,000
Dudley	600,000
Dundee	1,500,000
Dundee	1,650,000
Dunedin, N.Z.	150,000
Dunedin	275,000
Durham	200,000
Dusseldorf	1,000,000
Eastbourne	1,250,000
Eastbourne	1,550,000
Edinburgh	2,000,000
Eindhoven	1,500,000
Enschede	282,000
Epping	500,000
Epsom	225,000
Epsom	330,000
Essen	1,400,000
Essen-Borbeck	1,400,000
Exeter	1,100,000
Exeter	1,200,000
Exmouth	376,000
Falmouth	150,000
Falmouth	200,000
Faversham	200,000
Flensburg	300,000
Flensburg	125,000
Forst	300,000
Frankenthal	175,000
Fuel Research Wks.	500,000
Fuel Research Wks.	500,000
Furnes	500,000
Gablonz	140,000
Gas L. & C. Co.:	
Beckton	10,000,000
Beckton	7,000,000
Beckton	3,500,000
Beckton	7,000,000
Beckton	7,000,000
Beckton	5,250,000
Beckton	4,500,000
Beckton	3,000,000
Beckton	1,500,000
Bow Common	1,000,000
Bow Common	1,150,000
Bow Common	150,000
Brentford	1,200,000
Brentford	850,000
Brentford	350,000
Brentford	750,000
Bromley	3,750,000
Bromley	2,250,000
Bromley	1,000,000
Bromley	1,000,000
Bromley	1,000,000
Bromley	1,450,000
Bromley	1,350,000
Fulham	2,500,000
Fulham	1,700,000
Ilford	650,000
Ilford	750,000
Kensal Green	2,250,000
Kensal Green	2,250,000
Kensal Green	2,250,000
Nine Elms	2,750,000
Nine Elms	750,000
Nine Elms	1,870,000
Nine Elms	2,850,000
Shoreditch	900,000
Shoreditch	2,700,000
Shoreditch	2,725,000
Southall	2,000,000
Southall	3,000,000
Staines	600,000
Stratford	1,700,000
Stratford	850,000
Stratford	2,350,000
Stratford	2,350,000
Gelsenkirchen	175,000
Gelsenkirchen	350,000
Geneva	500,000
Geneva	700,000
Geneva	1,270,000
Gennevilliers	10,600,000
Gennevilliers	2,900,000
Girvan	235,000
Glasgow	3,000,000
Glasgow	2,500,000
Glasgow	2,250,000
Glossop	340,000
Gloucester	800,000
Gloucester	1,000,000
Gosport	200,000
Gosport	225,000
Göteborg	300,000
Göteborg	600,000
Graudenz	200,000
Grays	250,000
Grays	400,000
Grays	725,000
Groningen, Holland	500,000
Guest Keen & Piggotts, Ltd.	1,936,000
Guildford	300,000
Guildford	200,000
Guildford	350,000
Guildford	1,100,000
Guildford	150,000
Haarlem	850,000
Hamburg	1,750,000
Hampton Court	500,000
Hampton Court	600,000
Hampton Court	1,100,000
Hanley	800,000
Hanley	800,000
Hartlepool	750,000
Hartlepool	765,000
Hastings	1,250,000
Haywards Heath	470,000
Hebden Bridge	200,000
Heidelberg	200,000
Hereford	525,000
Hertford	197,000
Hertford	244,000
Hessle	150,000
Heywood	500,000
High Wycombe	752,000
Hilversum	850,000
Hinckley	250,000
Holyhead	197,000
Hong Kong	450,000
Hong Kong	450,000
Hornsey	1,000,000
Hornsey	1,000,000
Hornsey	750,000
Hornsey	750,000
Horsham	235,000
Hull	1,500,000
Hull	1,000,000
Hull	1,600,000
Innsbruck	200,000
Ipswich	750,000
Ipswich	1,250,000
Ipswich	600,000
Jersey	564,000
Jersey	564,000
Kampen	350,000
Karlsbad	350,000
Kendal	329,000
Kidsgrove	235,000
Kiel	1,000,000
Kiel	880,000
Kilmarnock	500,000
Kilmarnock	585,000
King's Lynn	197,000
King's Lynn	400,000
Kirkintilloch	360,000
Kirkintilloch	827,000
Kolozvar	100,000
Lancaster	500,000
Langley Mill	500,000
Largs	235,000
Lausanne	250,000
Lausanne	385,000
Le Mans	420,000
Lea Bridge	350,000
Lea Bridge	350,000
Lea Bridge	400,000
Lea Bridge	1,000,000
Lea Bridge	1,500,000
Lea Bridge	1,530,000
Leamington	600,000
Leamington	525,000
Leatherhead	705,000
Leeds	1,500,000
Leeuwarden	400,000
Leiden	500,000
Leiden	575,000
Leigh	350,000
Lemberg	260,000
Lemberg	500,000
Letchworth	362,000
Letchworth	423,000
Liége	1,000,000
Liége	750,000
Lille	860,000
Lincoln	500,000
Lincoln	893,000
Liverpool	3,500,000
Liverpool	4,500,000
Liverpool	750,000
Liverpool	1,750,000
Liverpool	1,250,000
Liverpool	3,000,000
Liverpool	1,500,000
Liverpool	1,250,000
Liverpool	2,350,000
Long Eaton	430,000
Long Eaton	170,000
Longton	600,000
Louvain	800,000
Lubeck	400,000
Luton	400,000
Maastricht	200,000
Macclesfield	800,000
Magdeburg	1,400,000
Maidenhead	225,000
Maidenhead	225,000
Maidenhead	175,000
Maidenhead	175,000
Maidenhead	200,000
Maidenhead	200,000
Maidstone	500,000
Maidstone	500,000
Malines	500,000
Malines	575,000
Malmo	350,000
Malta	400,000
Manchester	3,500,000
Manchester	3,500,000
Manchester	1,500,000
Mansfield	330,000
Mansfield	433,000
Marlborough	100,000
Mayence	700,000
Melbourne	5,630,000
Merthyr Tydfil	300,000
Merthyr Tydfil	200,000
Middlesbrough	1,250,000
Middlesbrough	750,000
Middlesbrough	900,000
M/M. Woolston	9,000,000
Monaco	275,000
Monaco	618,000
Monaco	618,000
Mons	500,000
Montevideo	1,222,000
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Moscow	1,000,000
Munich	1,400,000
Namur	175,000
Narbonne	350,000
Nelson	400,000
Nelson	350,000
Neuss	140,000
Newbury	250,000
Newcastle	2,500,000
Newcastle, N.S.W.	500,000
Newport Pagnell	188,000
Nice	900,000
Nietheroy	250,000
N. Middlesex	150,000
N. Middlesex	200,000
N. Middlesex	75,000
N. Middlesex	650,000
N. Middlesex	650,000
N. Middlesex	1,000,000
Northfleet	235,000
North Sydney	500,000
North Sydney	500,000
Norwich	1,000,000
Norwich	300,000
Norwich	500,000
Norwich	1,500,000
Nottingham	1,000,000
Nottingham	1,000,000
Nuneaton	125,000
Oberhausen	175,000
Oldbury	500,000
Oldenburg	200,000
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Ostend	100,000
Ostend	200,000
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Palermo	850,000
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Ivry	1,570,000
Landy	6,000,000
Landy	6,000,000
Landy	5,295,000
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La Villette	2,000,000
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Perth, W.A.	1,000,000
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Portsmouth	2,000,000
Portsmouth	800,000
Portsmouth	2,000,000
Posen	450,000
Posen	700,000
Prague	140,000
Preston	1,400,000
Ramsgate	430,000
Reading	1,000,000
Reading	1,000,000
Reading	600,000
Redditch	500,000
Redhill	275,000
Redhill	300,000
Redhill	1,100,000
Reichenberg	200,000
Reichenberg	200,000
Reval	350,000
Rhymney	175,000
Rhymney	250,000
Riddings	258,000
Ripley	120,000
Rochester	2,200,000
Rochester	2,800,000
Romford	300,000
Romford	350,000
Romford	1,200,000
Rotterdam	850,000
Rotterdam	1,500,000
Rotterdam	750,000
Rotterdam	750,000
Rotterdam	600,000
Rotterdam	2,000,000
Royston (Yorks.)	250,000
Rugby	1,000,000
Rugby	450,000
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St. Gallen	225,000
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Sté. Kuhlmann	2,150,000
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Scarborough	200,000
Scarborough	350,000
Scarborough	1,300,000
Scarborough	1,350,000
Seaford	200,000
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Shanghai	225,000
Shanghai	1,600,000
Shanklin	259,000
Shanklin	400,000
Sheerness	200,000
Sheerness	180,000
Sheerness	200,000
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Southampton	800,000
Southampton	500,000
Southampton	600,000
Southampton	100,000
Southampton	1,000,000
Southampton	1,450,000
Southend	1,250,000
Southend	900,000
Southend	900,000
Southgate	400,000
Southgate	500,000
Southgate	800,000
Southgate	500,000
Southport	750,000
Southport	900,000
Southport	900,000
Southport	450,000
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South Shields	1,250,000
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Stirling	970,000
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Stockholm	1,750,000
Stockport	600,000
Stockport	600,000
Stockport	400,000
Stockport	400,000
Stockton	500,000
Stockton	25,000
Stourbridge	500,000
Stourbridge	500,000
Sunderland	2,250,000
Sunderland	300,000
Sutton	1,269,000
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Swansea	750,000
Swansea	1,000,000
Swansea	450,000
Swansea	1,250,000
Swansea	2,000,000
Swindon	300,000
Swindon	450,000
Swindon	400,000
Sydney	1,000,000
Sydney	1,000,000
Sydney	1,000,000
Sydney	1,000,000
Sydney	8,250,000
Taunton	225,000
Taunton	350,000
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The Hague	1,500,000
The Hague	775,000
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Torquay	350,000
Torquay	320,000
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Tottenham	750,000
Tottenham	350,000
Tottenham	1,000,000
Tottenham	1,000,000
Tottenham	1,250,000
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Tottenham	1,000,000
Tottenham	500,000
Tottenham	1,000,000
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Tunbridge Wells	1,000,000
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Tynemouth	1,100,000
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Utrecht	1,000,000
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Uxbridge	1,000,000
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Vevey, Switz.	650,000
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Vienna	2,500,000
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Walsall	375,000
Waltham	400,000
Waltham	140,000
Wandsbek	125,000
Wandsworth	1,800,000
Wandsworth	4,230,000
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Ware	150,000
Ware	282,000
Warwick	125,000
Wasmuel	500,000
Watford	300,000
Watford	350,000
Watford	400,000
Watford	1,250,000
Wath	430,000
Weimar	100,000
Wellingborough	525,000
Wellingborough	525,000
Wellington, N.Z.	350,000
Wellington	300,000
West Bromwich	550,000
Westgate	250,000
Weston-Mare	350,000
Weston-Mare	350,000
Weston-Mare	150,000
Weston-Mare	150,000
Weston-Mare	500,000
Wexford	100,000
Weymouth	400,000
Weymouth	100,000
Weymouth	658,000
Whitstable	423,000
Widnes	500,000
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Wigston	250,000
Winchester	225,000
Winchester	125,000
Winchester	410,000
Woking	400,000
Wolverhampton	1,500,000
Wolverhampton	1,000,000
Wolverhampton	250,000
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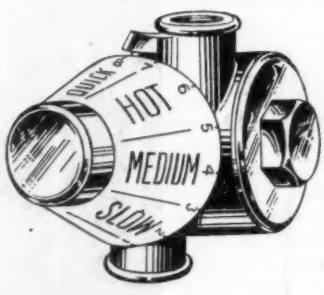

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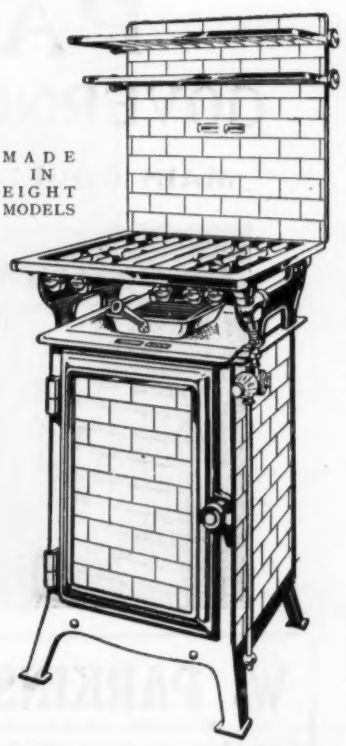

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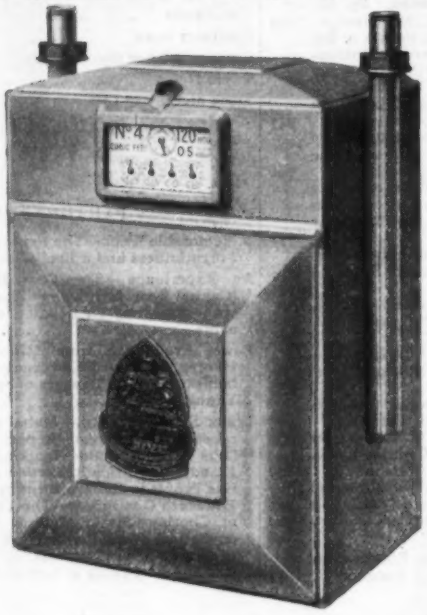

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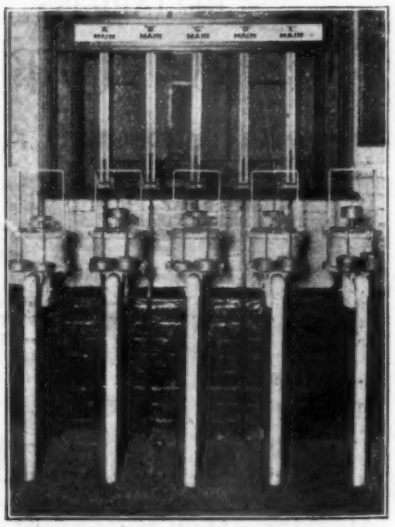

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